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THE ISLAND OF PORTO RICO

A COMPILATION OF FACTS AND SOME COMMENTS ON THE
GEOGRAPHY OF THE COUNTRY

BY

CLAUDIO CAPO



THE GLOBE PUBLISHING COMPANY

SAN JUAN, P. R.

1925

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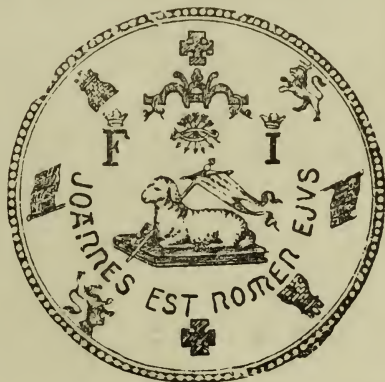


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Of all the beauty spots of Earth, the fairest and the best
Are the jewels of the Caribbean, the Islands of the West.

—ALLISTER MACMILLAN'S "The Isles of the West."



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Map of the Island of Porto Rico

FIRST PART
PHYSICAL FEATURES

I

GENERAL ASPECTS

The chain of islands which in arch-like form extends from the tip of the peninsula of Florida to the northeast of Venezuela is all that remains above water from an ancient and now sunken continent. Of the four largest of these islands, or Greater Antilles, the smallest is Porto Rico.

The Island of Porto Rico is situated well within the Tropics, standing between latitudes $17^{\circ} 54'$ and $18^{\circ} 30'$ north, and longitude $65^{\circ} 35'$ and $67^{\circ} 15'$ west from Greenwich. Porto Rico is about 75 miles east of the island of Haiti (Santo Domingo), 40 miles west of St. Thomas, 450 miles from the nearest point of Cuba, 1,000 miles from Panama, a little over 1,400 miles from New York, and some 3,000 miles from Gibraltar.

Being a part of the barrier separating the Caribbean Sea from the Atlantic Ocean, Porto Rico has the Atlantic on the north, the Mona Passage on the west, the Caribbean Sea on the south, and the Virgin Passage on the east.

In shape the Island is almost a perfect rectangle, approximately 100 miles long, from east to west, by 35 miles wide, north to south. The sea line is generally straight and the coast usually low, although there are a few headlands and indentations, as we can observe by making the following coast survey.

From San Juan to Fajardo.—Starting from San Juan, in the north, we shall sail eastward along the coast. Built on top of the cliff which borders the Capital City by the ocean side are the ancient fortifications, Morro Castle, with its light-house, and San Cristóbal Fort immediately after it; then follow Escambrón and Boquerón points, and, between the two, the entrance to the beautiful San Antonio Cove. Piedritas Point and lake San José follow and then Cangrejos Point and mouth. Torrecillas, Maldonado and Vacía Talegas come successively into view, and, right after, the mouth of Great Loíza River, with the old Loíza Town built upon its right bank and on the coast. Iglesia, Uvero and San Agustín

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points follow in succession, and then Miguillo and Picúa points with Comezón Cove between the two. At Picúa Point our direction will be changed nearly to the southeast; then Percha and Embarcaderos points will be reached with the town of Luquillo appearing just upon the coast. Yegua Cove is enclosed by San Diego Point and the headlands of San Juan with its light-house towering above. This is the northeastermost point of Porto Rico, 30 miles from San Juan; and here naturally our direction must be changed towards the south, leaving Hicacos and many other smaller cays to the left. Then comes Palominos Islet and Fajardo Playa, the town itself standing about one mile inland. Numerous cays and islets, like the above-mentioned Palominos, are now coming into view, and the island of Culebra, in the distance, precisely east of Fajardo.

From Fajardo to Arroyo.—As we leave Fajardo and sail towards the south, we shall next see Barrancas and Mata Redonda points, with Majagua and Medio Mundo Bay following, and the small town of Ceiba a little distance inland. The islets of Medio Mundo, Piñero, Cabeza de Perro, Puerca and Cabras will appear successively, the last one of them with a light-house on it. The island of Vieques (Crab) will be seen eight or nine miles off, to the left. Ensenada Honda, the largest indentation of the east coast of Porto Rico, comes next, with Cascajo Point in its southern extremity. By this time we shall have changed our direction to the southwest, and will find, upon the right, Algodones Bay and Lima Point with Naguabo Port right after. Humacao Playa and Santiago Cay in front of it follow, and in succession El Morrillo, Morro de Humacao, Candelero, Barbacoa, Fraile, Hicacos and Yabucoa points with Yabucoa Playa immediately after; and then Quebrada Honda Point and Punta Yegua, which is the southeastern angle of Porto Rico. The distance from Punta Yegua back to Cabezas de San Juan is 29 miles.

Toro Point and then Punta Tuna, with its light-house come next into view, and this is followed by Mala Pascua Cape on the coast of Maunabo, the most imposing headland of Porto Rico. From here our direction will be toward the west. Viento Point, the Port of Patillas and Punta Figuras, with its light-house, follow one after the other, and then the port and little town of Arroyo.

From Arroyo to Ponce.—Sailing westward from Arroyo, we shall pass Barrancas Point, Las Mareas, Ola Grande and Pozuelo Point with several islets—Caribes, Barca, Pájaros—which mark the en-

trance to Jobos Harbor, one of the best in the Island. Here Central Aguirre is located, one of the greatest sugar mills in the country. Ratones, Caracoles, and Jauca islets, and La Luna and Alféñique reefs are strung in front and to the south of Rincón Bay, whose eastern and western extremes are marked by Arenas and Petrona points. In front of Cayito Point, in Santa Isabel, is Berbería Islet, and further out, to the southwest, Caja de Muertos where there is a light-house. Several reefs and islets mark the entrance to the Port (Playa) of Ponce, the largest of the latter being Cardona, with a light-house on it.

From Ponce to Mayagüez.—After Gatos and Salinas points, which are the extreme limits of Ponce Harbor, Cucharas Point will be seen, and then the smaller islands of María Larga, Caribe, Parga, Ríos and Palomos, in Tallaboa Bay. Guayanilla Point comes next and between it and Barracos Point is the fine, well protected, though not very deep harbor of Guayanilla. Criollos Point follows, and between Meseta Point, with its light-house, and Pescadores Point comes Guánica, the best natural anchorage in Porto Rico. The largest sugar mill in the Island is located here. The small Pargas Inlet stands between Pescadores and Brea points; then come Jorobado Point, Salinas Cove and numerous reefs and cays strung along the coast, in front of Montalva, Isla Mata and Parguera, up to Tocón Point; Falucho and Margarita passes give access to the main land here. Next come Playa Sucia Bay and then the Morrillos de Cabo Rojo, with its light-house which marks the southwest extremity of the Island. The distance between Cabo Rojo and Punta Yegua is 79 miles.

After Salinas Bay, and in order to turn around Aguila Point, our direction must be changed entirely towards the north. We shall enter the Guanajibo Channel, between the mainland on the right and a continuous line of shoals and banks on the left, and after Casabe and Melones point will come Boquerón Bay, Guaniquilla, Boca Prieta and the Port Royal of Cabo Rojo, the town itself being about two miles inland. Pedernal, Ostiones and Punta Arenas will appear successively, with Joyuda Lake standing back of the point last named. After Bramadero Bay comes Mayagüez anchorage and port, with the city standing a little inland.

From Mayagüez to Arecibo.—Sailing northward from Mayagüez harbor we pass Algarrobo Point and then Añaseo Bay, where we must change our direction to the northwest in order to follow the coast, upon which Cadena Point appears first, and then the town

of Rincón and Punta Jigüero, with a light-house towering on top and marking the extreme western projection of Porto Rico. The small island of Desecheo is seen to the west. We now change our direction to the northeast and follow the coast to Aguada Point and Aguadilla Bay. Here, upon the right bank of the Culebrinas River, a stone monument marks the spot where Columbus' eventful landing took place, in 1493. The important town of Aguadilla appears upon the coast, and further north, Point Borinquen, the northwestern extremity of Porto Rico, with a light-house built on top. From this point to Morrillos de Cabo Rojo the distance is 40 miles.

We must now steer to the northeast but, immediately after reaching Agujereada Point, the direction must be precisely east, to follow the northern coast. Pozo Jacinto, Sardina,—with the town of Isabela back of it—Peñón, and the little twin towns of Camuy and Hatillo come successively into view, until we reach the important city of Arecibo, upon the coast, and on the left bank of the Arecibo River.

From Arecibo to San Juan.—Beyond Arecibo and slightly to the northeast we see the Morrillos de Arecibo with its light-house. Then appear in succession, as we proceed, Caracoles, Tunas, Palmas Altas, Manatí and Barquilla points; Tortuguero Point and Lake, come next, and then, in the order named, Chivato, Puerto Nuevo, Piedra Gorda, and Fraile Points. Boca Juana Point marks the mouth of the Plata River, and after that come Salinas Point and Palo Seco, in front of which is Cabras Islet, marking the entrance to the port of San Juan, our starting point. From Point Borinquen to San Juan the distance is 60 miles; and the total length of our trip around the Island will be about 240 miles.

Porto Rico has a total area of 3,435 square miles. The main Island is 3,349 miles in extent, and the adjacent small islands of Vieques, Mona, Culebra and a few other islets are 51.5, 19.5, 11 and 4 miles respectively. The territory as a whole is thus about five-sixths the size of either Jamaica or Hawaii, the largest island of its group. It is one-eighth as large as the island of Haiti; seven-tenths the size of Connecticut and four times as large as Long Island.

COMMENT.—Porto Rico stands midway between the continents of North and South America, guards the Atlantic approach to the Panamá Canal and therefore could hardly be better situated from a strategic point of view. Its importance in this respect was early

recognized by Spain, when that power made San Juan a first-class fortified city. Commercially, as a distributing center, the value of this Island will grow steadily, while as a tropical garden spot for tourists the Island holds possibilities easily perceived by men of vision.

II

PHYSIOGRAPHY AND SOILS¹

As already explained, Porto Rico, and the other islands of the Antilles, Central America and northern South America were formerly, according to geologists, a united and distinct body of land—the Antillean continent. Then the land sank leaving only the tops of the mountains above water. After a while the ocean floor was again raised up, the old continent reappearing. The sediment of which it was composed, covered in the meantime by deep-sea muds and chinks, was then folded into huge mountain systems, some of the peaks reaching as high as 20,000 feet above sea level. The land again sank to the floor of the ocean, and broke up into the present island groups, Jamaica being the first to be isolated, then Cuba, and finally Porto Rico and Haiti.

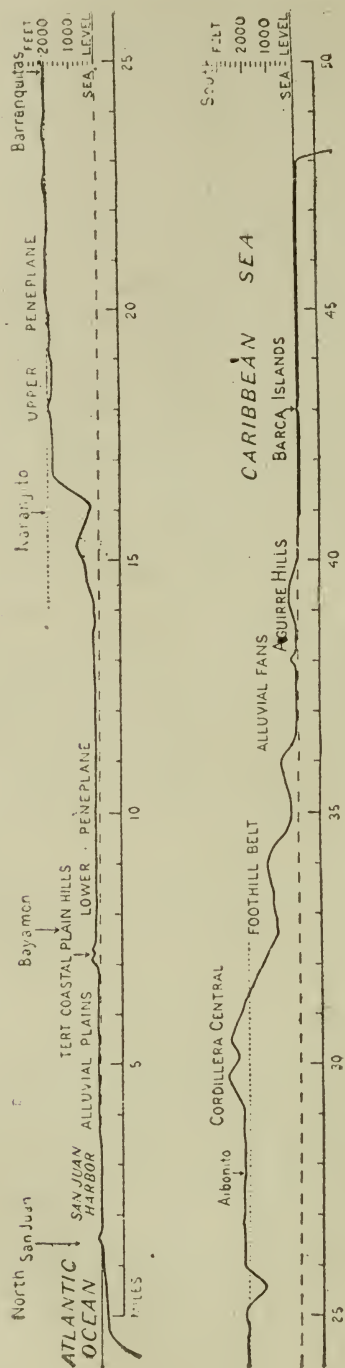
The *Brownson Deep*, one of the most profound chasms on the globe is a little less than 100 miles off the north coast of the Island, there being a vertical distance of not less than 27,000 feet from the bottom of the chasm to the present mountain heights. The ocean depths near the archipelago are the greatest known in the Atlantic.

There are at the present time three main formations in the Island of Porto Rico—a central mountainous core of volcanic origin, an elevated area of coral limestone surrounding the mountainous portion, and the coastal plain.

THE CENTRAL MOUNTAIN AREA

The central mountain area occupies by far the largest portion of the Island. Viewed from the sea it presents a rugged and serrated aspect; numerous peaks and summits, with no definite crest line, rise from a general mass, which has been cut by erosion into lateral ridges, separated by deep, steep-side gorges. The drainage divide is approximately parallel to the southern coast and about 10 to 15 miles distant from it. The region thus has a long and

¹ This chapter is, in part, a copy of the pages written by Mr. Louis S. Murphy, in his *Forests of Porto Rico*.



North-South Profile of Porto Rico

(Courtesy of New York Academy of Sciences)

relatively gentle inclination toward the north coast, but falls off rather abruptly toward the south.

The Sierra de Luquillo, the most easterly of the three ranges making up the central mountain mass, is surrounded by low coastal plains, and is completely isolated, except for a low water-divide which crosses near Las Piedras to the Sierra de Cayey. By thus completely dominating the landscape it gains the appearance of being very high, and one of its peaks, *El Yunque* (*The Anvil*) has been credited with being the highest on the Island. According to the most recent determinations this peak reaches an altitude of 1,059 meters while the east peak *El Carnero* (*The Ram*) reaches an elevation of 1,041 meters and the west peak *El Toro* (*The Bull*) is 1,017 meters high. These higher peaks are flanked by numerous lateral ridges which extend in every direction. The valleys, known as "*quebrados*", are deep and gorge-like and are separated one from another by very narrow, almost knife-edged ridges, thence called "*cuchillas*". Falls, cascades and rapids are conspicuous features of the drainage system herè. This range supports the only large tract of virgin forest growth of the Island.

The remaining mountain mass forms an uninterrupted expanse of broken uplands. The main crest line extends from Humacao on the east through Aibonito and Adjuntas to within a short distance of Mayagüez on the west coast. The portion east of Aibonito is known as the **Sierra de Cayey**; that to the west, the **Cordillera Central**. This region has an average elevation of about 750 meters, above which the higher peaks project irregularly, a few to an elevation of more than 1,100 meters. The thirteen highest peaks on the Island are in the *Cordillera Central*, the very highest being the *Jayuya* peak, 1,337 meters, situated about due south of the town of that name. The next peak in elevation is *Los Picachos*, in Ciales, the height being 1,309 meters.

Spurs branching out from the central mountains are very numerous, the main ones being known by the following names:

The Caribbean Range, which marks in great part the eastern hydrographic divide, extending from Naguabo to Maunabo

The Juan González or Toa Mountains from Bárros to Naranjito

The Indiera in Lares

The Corozal Range

The Guaybaná Mountains, from Sabana Grande to Villalba

The Guarionex Mountains, from Utuado to Camuy

The Aymamón, from Lares to Aguadilla

The Cadena Range, from San Sebastián to Rincón

The Atalaya, from Las Marías to Añasco

The Yagüeca or **Urayoán**, from Añasco to Maricao

The Peñones, from Cabo Rojo to Sabana Grande.

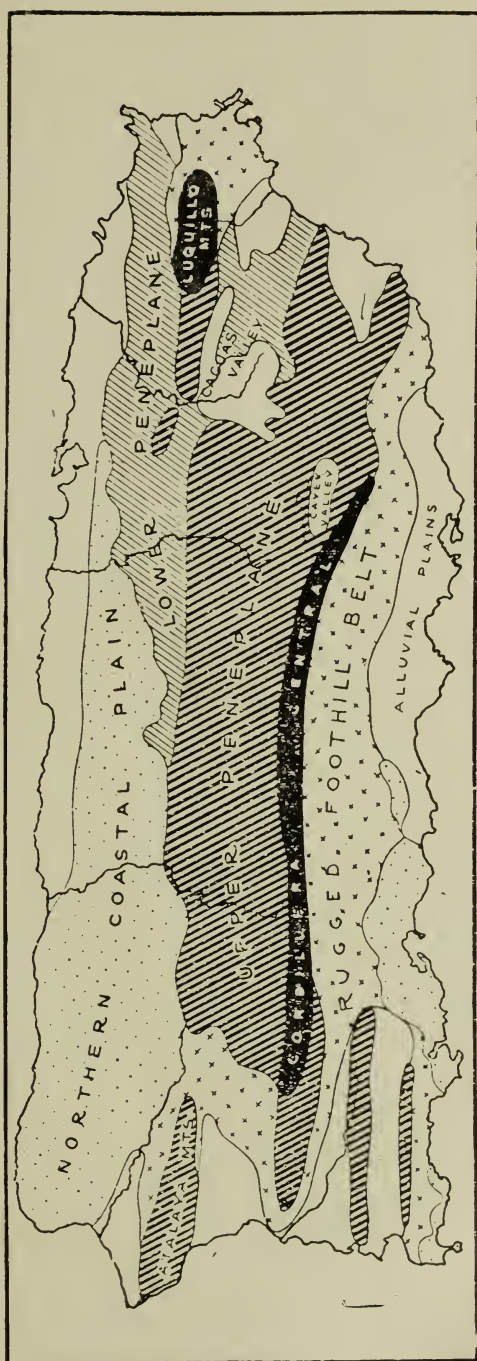
The central mountains are composed largely of dark-colored rocks of volcanic origin whose primary forms have been destroyed by erosion. The material thus worked over into sediment in prehistoric ages now occurs in well-defined strata. The characteristic soils are deep, reddish clay loams and tenacious red clays. So cohesive and compact are these soils that they are able to maintain themselves in an almost vertical position. Cultivation, in consequence, is in many places carried on to the very tops of the ridges and on the steepest slopes, yet evidence of excessive erosion and landslides is surprisingly inconspicuous.

THE CORAL LIMESTONE BELT

The belt of coral limestone is several miles wide in places, and on its interior border overlaps the region of volcanic or igneous rocks. This area is of sedimentary origin. Where rock solution has been the most active agent of decay, it retains the general form of a table-land. Where erosion has been the most active, only isolated conical hills remain. In certain parts of the Island the limestone extends directly to the water's edge, where it terminates in steep scarps, often 100 feet or more in height, notably on the south coast west of Ponce and on the north coast west of Quebradillas. Elsewhere on the Island the remnants of this formation stand as steep, sloping, solitary mounds or domes which rise singly or in chains above the coastal plain.

Along the junction of the central mountains and the limestone belt is a distinct line of weakness marking the former shore line. Strong valley lines are developed there, separating these two regions. These parting valleys are especially well developed on the south side of the Island along the *Guanajibo* River, at Sabana Grande, and on the north side, at the junction of the *Don Alonso* (or *Limon*) and *Arecibo* rivers.

An uninterrupted block of limestone formation, known in places as the **Pepino Hills** occurs along the north side of the Island, from Ciales nearly to Aguadilla, and is some 6 to 10 miles wide from north to south. It offers a marked contrast to the low rounded limestone hills which flank it to the north, because of its greater elevation, rough, sharp relief, pitlike valleys, bare rock outcrops of



Physiographic Regions of Porto Rico
(A. K. Lobeck)

chalky whiteness, and subterranean drainage. Wherever the large rivers such as the Río Grande de Arecibo and the Manatí, cross this area they have cut deep, canyonlike valleys whose sheer cliffs of considerable height occasionally rise directly from the water's edge. Otherwise the area is strongly devoid of surface drainage features. The hills are very closely packed together, their connecting ridges being hardly more than rocky partitions separating the disconnected pit-like valleys. The steep-sided depressions show, on a tremendous scale, to what an enormous extent rock solution takes place under tropical conditions.

This region, if viewed from above, would look like a honeycomb. Not infrequently the sinks are 100 feet and occasionally 200 feet or more deep. The large pits sometimes contain an acre or more of bottom with a fertile soil commonly under cultivation to such crops as coffee, bananas, vegetables and root crops (*frutos menores*). The bottoms of others are occupied by bogs or small lakes. The crags and summits are almost invariably wooded. Caves, which mark the early stages of pit formation, are common.

THE COASTAL PLAIN

The sandy ridge fronting the coast forms a barrier between the sea and a narrow low-lying area scarcely above tide-water level, and partly marine and partly alluvial in origin. On the north side of the Island there are many swamps and lagoons covered with a thick growth of mangrove bushes. The most typical are the *Caño* and *Laguna de Tiburones* between Arecibo and Barceloneta, *Laguna del Tortuguero* north and east of Manatí, and the string of lagoons east of and connected with the harbor of San Juan. On the south side, the mangrove areas are only slightly developed, but there are in places extensive saline plains too low and wet for cultivation, where rank grasses, a few scattered acacias, or low, succulent, salty herbs constitute the only vegetation.

The coastal plain proper is elevated but a few feet above the sea, and has but slight inclination toward the mountains. It terminates rather abruptly at the foothills, except in the valleys of the larger rivers. These plains are entirely sedimentary, having been laid down when the Island stood at a somewhat lower level than now.

The coast-plain hills are isolated, low, and dome-shaped. Some have been nearly buried by the alluvial deposits of the rivers; others rise 100 feet or more above the level of the plain.

The soil, except on the hills, is largely alluvium, sandy in places, and almost entirely under cultivation or in pasture.

CAVES. — Underground caverns are characteristic of limestone formations. The constant percolation and drip of water saturated with lime causes the formation of long *stalactites* pending from the roof; drops fall on the floor until in time the deposit of carbonate of lime becomes an upright rod called a *stalagmite*.

Because of the conditions just described, caves are more abundant in Porto Rico, in the region of limestone referred to, several of the rivers in that part of the Island disappearing by filtration to reappear farther down the valley. Some of these caves are rich in Indian relics, besides containing considerable quantities of fertilizing guano, or bat manure. A conservative estimate made by the Federal Government puts the total amount of these deposits of guano at over sixteen thousand tons.

The *Pejita* in Lares, the *Muertos* in Utuado, and the *Consejo* in Arecibo are the best known of these caves, but in Aguas Buenas, Las Marías, Cabo Rojo, Caja de Muertos, Camuy, Ciales, Comerío, Isabela, Juana Díaz, Manatí, Mona Island, Morovis, Peñuelas, San Germán and Trujillo Alto caves have been located, and the manure from many of them is actually being extracted for use in soil fertilization.

III

EARTHQUAKES

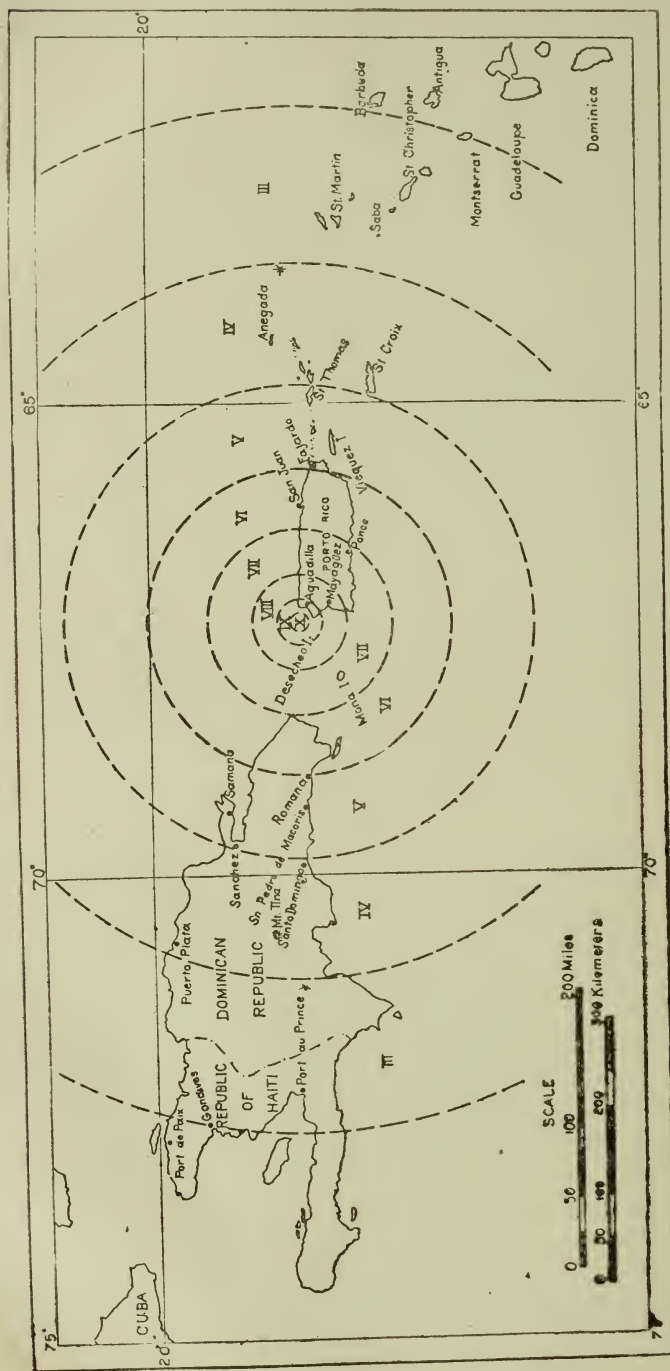
Some earthquakes are due to volcanic eruption, but many of the most severe ones have no immediate connection with volcanic activity. The part of the earth's surface directly above the focus of an earthquake is called *epicenter*.

The Island of Porto Rico being situated very close to one of the various fractures or *faults* occurring in the earth crust, it is almost positive that all the seismic shocks felt here are due to the shift of the terrestrial crust along that line of fracture.

To understand better the origin of these quakes, below is copied part of the report of Messrs. Reid and Taber, members of the Earthquake Investigation Commission that visited Porto Rico immediately after the earthquake of October 1918.

"Porto Rico is bordered by a fairly level beach, having a depth of 10 to 20 fathoms, which extends to the east as far as the Anagada Passage. From

THE ISLAND OF PORTO RICO



Isseismic Map of Porto Rico
(Seismological Commission, 1913)

it rise the islands of Vieques, Culebra and the whole Virgin group with the exception of St. Croix. At the edge of the bench the sea bottom drops at a very steep slope to a depth of many hundred fathoms. On the southeastern coast of Porto Rico the edge lies within three or four kilometers of the shore, it then strikes a little north of east, passing about six kilometers of Vieques and about 16 kilometers of St. Thomas. It then passes around the Virgin group and returns along the northern coast of Porto Rico. Near the middle of the triangle formed by Vieques, St. Thomas and St. Croix the depth is very great, amounting to 2,500 fathoms. This is the deepest part of a great channel connecting with the Caribbean Sea to the southwest at depths of 900 to 1,000 fathoms, and with the Atlantic through the Anegada Passage at depths of over 1,000 fathoms. St. Croix partially limits this channel on the south rising with extraordinary steepness from great depths. At one point only six kilometers from the shore the depth is 2,376 fathoms. Vaughan considers that this channel has been formed by the depression of its bed between great fractures in the rock, being what geologists call a *fault-trough*; and that the depression was formed in very recent geological times. All considerations favor this view, and it is fairly certain that the trough, even at the present time, is growing deeper."

Historical records show that since the year 1772 earth shocks have been felt in Porto Rico almost every year, but the greatest activity of seismic disturbance occurred during the years 1867-68 and 1918. The eastern part of the Island suffered most in the earlier period, while the western region was far more affected than the rest of the Island in the quakes of 1918. In each case the strongest shock occurred in the beginning and was followed by numerous aftershocks which continued through a period of several months. The aftershocks varied in their intensity and in frequency. The initial earthquake of each period was apparently due to a vertical displacement of an old fault; it was characterized by vertical vibrations of the ground, and was immediately followed by a great sea wave which traveled far from the place of origin or epicenter, especially on the side where the water was deepest. Both disturbances were submarine and originated on the edge of a deep trough.

Although none of the quakes occurring in this region of the globe can compare in destructiveness with those of southern Italy, Japan or Western America, still 116 persons lost their lives and \$4,000,000 in property were lost as the result of the 1918 shocks. As earthquakes are likely to occur at any time, proper precautions should be taken as far as it is humanly possible, particularly in the matter of building construction.

IV

CLIMATE

The climate of a country is the condition of its atmosphere as regards temperature, humidity, etc. These are mainly affected by the following:

- (1) Distance from the equator (latitude)
- (2) Distance from the sea
- (3) Height above the sea level (altitude).

Temperature, rainfall and winds are the most important factors to be considered in the study of the climate of Porto Rico.

Temperature.—Porto Rico, in common with all islands within the area swept by the northeast and southeast trade winds, has a warm but equable and comfortable climate. The small extent of the Island, with its moderate elevations above sea-level, insures a uniformity of temperature characteristic of marine climates in all latitudes. A record covering a period of more than ten years at over forty selected stations shows a mean annual temperature for the Island, combining the records at all stations, of 76° F. During the coolest month of the winter season the average is 73°, and during the warmest month of summer it is 79°. The variation of the mean annual temperature has very restricted limits, having varied only about 1° above and below 76° during a period of ten years. The average temperature during the month of February, which shows the greatest variation, has fluctuated only between the limits of 75° and 71°.¹

The above values represent average conditions for the Island as a whole, coast and mountain stations combined. The figures will vary somewhat with elevation and other topographic conditions. For the towns situated upon the narrow coastal plain encircling the Island the average annual temperature is 78°, the average for January 75°, and for August 81°; at inland stations the average annual falls to a minimum of 72°, with 69° during January and 75° during August. The lowest temperatures are naturally those experienced along and near the summit of the main divide, at elevations varying from 2,000 to 3,000 feet; here the mean annual temperature falls below 72°. At Aibonito the mean temperature for the year is 72°, with a January mean of 67°, and a mean for

¹ The well known article on the Climate of Porto Rico, by Dr. Oliver L. Fassig, is largely reproduced in this chapter.

August of 76° . The highest mean temperature for August in five years was 77° and the lowest January mean was 66° .

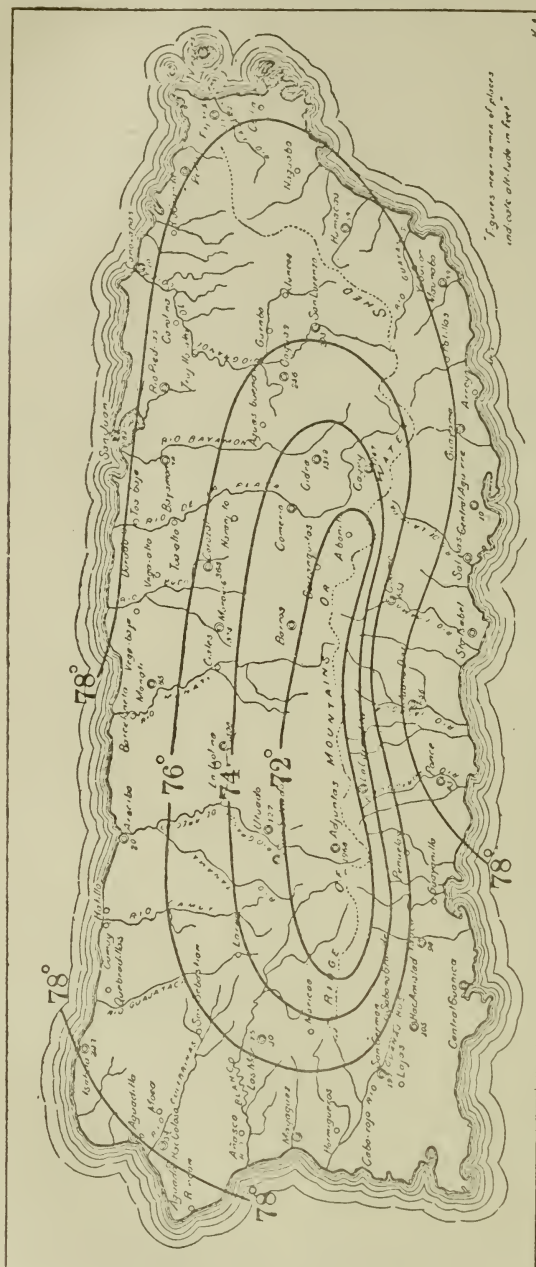
The Island of Porto Rico has a mean temperature below that of places in the tropics having the same latitude, as shown by the following figures:

**Normal Temperature for the Parallel of 18 Degrees North Latitude and of
Porto Rico**

	18 D. N. North Lat.	Porto Rico	Difference
January -----	72.4 degrees	72.2 degrees	0.2 degree
July -----	82.4 degrees	78.8 degrees	3.6 degrees
Year -----	78.8 degrees	76.4 degrees	2.4 degrees

San Juan has a more equable temperature than any other portion of the Island, due to the fact that the city is almost surrounded by water—the ocean to the north and the harbor to the south. But few of the cities and towns of Porto Rico were built upon the immediate coast; the coastal plain towns have their *plazas* or beaches, but the towns themselves were located two or more miles inland, beyond the reach of chance shots from passing vessels in the early days of the colony. Hence the temperature records of the coast towns show a diurnal range much greater than that of San Juan. The inland stations show a much larger difference between the early morning and the afternoon temperatures.

January is, on the whole, the coolest month of the year, although there is but a fraction of a degree difference between the mean temperatures of January and February. From March on there is a steady rise in the mean temperature, until a maximum is reached in August generally, although frequently it occurs in July or in September. The differences between the mean temperatures of July, August, September and October, are very slight, and probably are due to differences in the rate of wind movement, or variations in the amount of cloudiness. During the winter months the mean daily temperature is from 75° to 76° along the coast, decreasing to 74° over most of the coastal plain. At stations farther inland the mean temperature ranges between 72° and 68° depending upon the elevation above sea-level. During the summer and early fall the mean temperature along the coast is 80° to 81° , although it frequently rises to 82° or 83° along the southeast coast. At the more elevated stations the mean summer temperatures vary from 76° to 74° . There is a fairly constant difference of 6° to 8° between the coast temperatures and those of the higher inland stations, throughout the year.



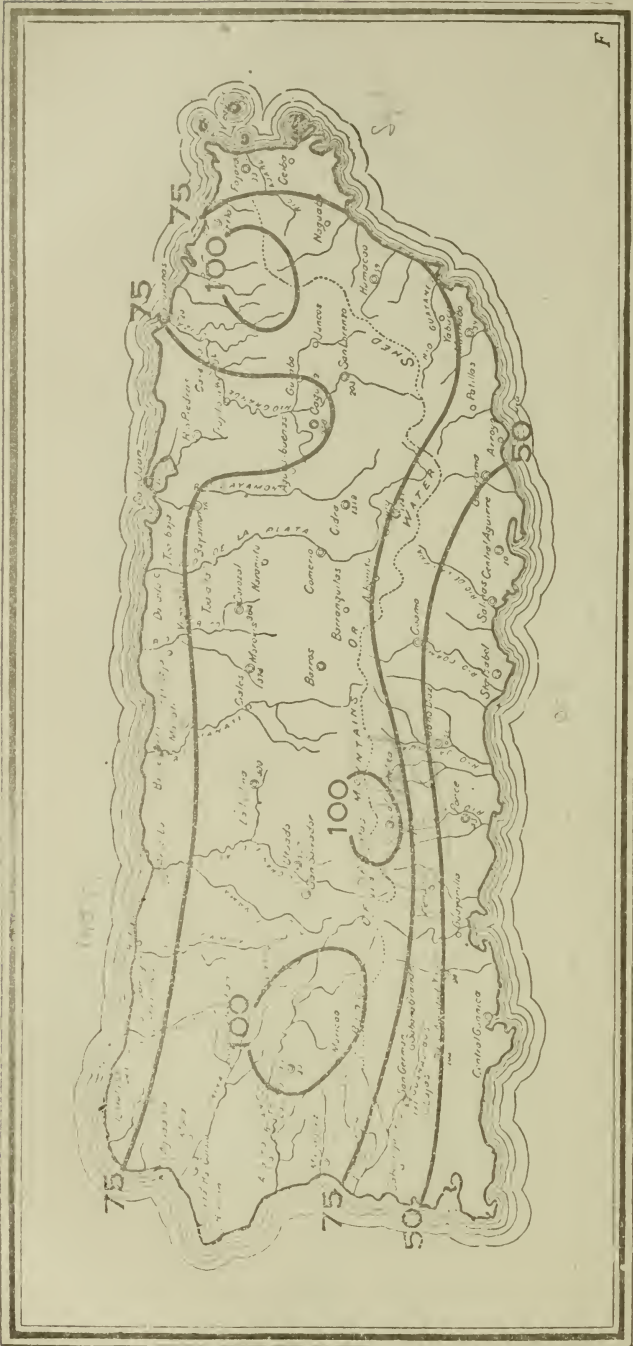
Mean Annual Temperature, Porto Rico

The highest temperatures recorded during a period of ten years in Porto Rico do not differ greatly in different portions of the Island; at the more elevated inland stations the range is between 90° and 95° , while along the coast and in the valleys they range from 95° to 100° . Only on three occasions during ten consecutive years has a temperature exceeding 100° been recorded at any of the forty-odd stations on the Island. In August 1906, a maximum of 103° was reported from San Lorenzo, in the east-central portion of the Island, and again in September of the same year a temperature of 101° ; in September, 1908, the weather observer at Arecibo, on the north-west coast, reported a temperature of 101° .

There is a greater variation in the early morning temperatures: At the stations near the coast and at most of the interior stations, the lowest recorded temperatures range between 50° and 55° ; at stations on the immediate coast, which are more under the influence of the uniform ocean temperatures, the minimum rarely falls below 60° ; at higher stations in the mountains the minimum frequently falls to 45° , and has been as low as 43° at Aibonito, at an elevation of 2,000 feet, and probably lower at greater elevations along the summit of the main divide.

Rainfall.—The average annual rainfall for the entire Island is 77.30 inches. This value is based upon the records of 44 stations covering a period of twelve years. The annual precipitation varies greatly, both from year to year, and in geographical distribution. In 1901 the average amount for the Island as a whole was 93.72 inches, and in 1907, only 64.18 inches. The variations in geographical distribution are even greater: In the Luquillo Mountains, where rainfall is heaviest, the average annual amount exceeds 135 inches, with a maximum in 1901 of 169 inches; along portions of the south coast the average annual amount is less than 40 inches, with a minimum, at Aguirre in 1907, of 21 inches. At stations along and near the south coast the average annual rainfall is about 45 inches; along the north coast, the average is about 65 inches. Along the west coast the rainfall is greater, the annual fall being 75 inches, while along the east coast and at inland stations the average increases to 85 inches. These variations in the annual rainfall are due to differences of elevations, and to the trend of the mountain ranges with reference to the prevailing winds.

There are three well-defined areas of heavy rainfall, in each of which the annual amount exceeds 100 inches: (1) The Luquillo Range, a heavily wooded and comparatively inaccessible region in



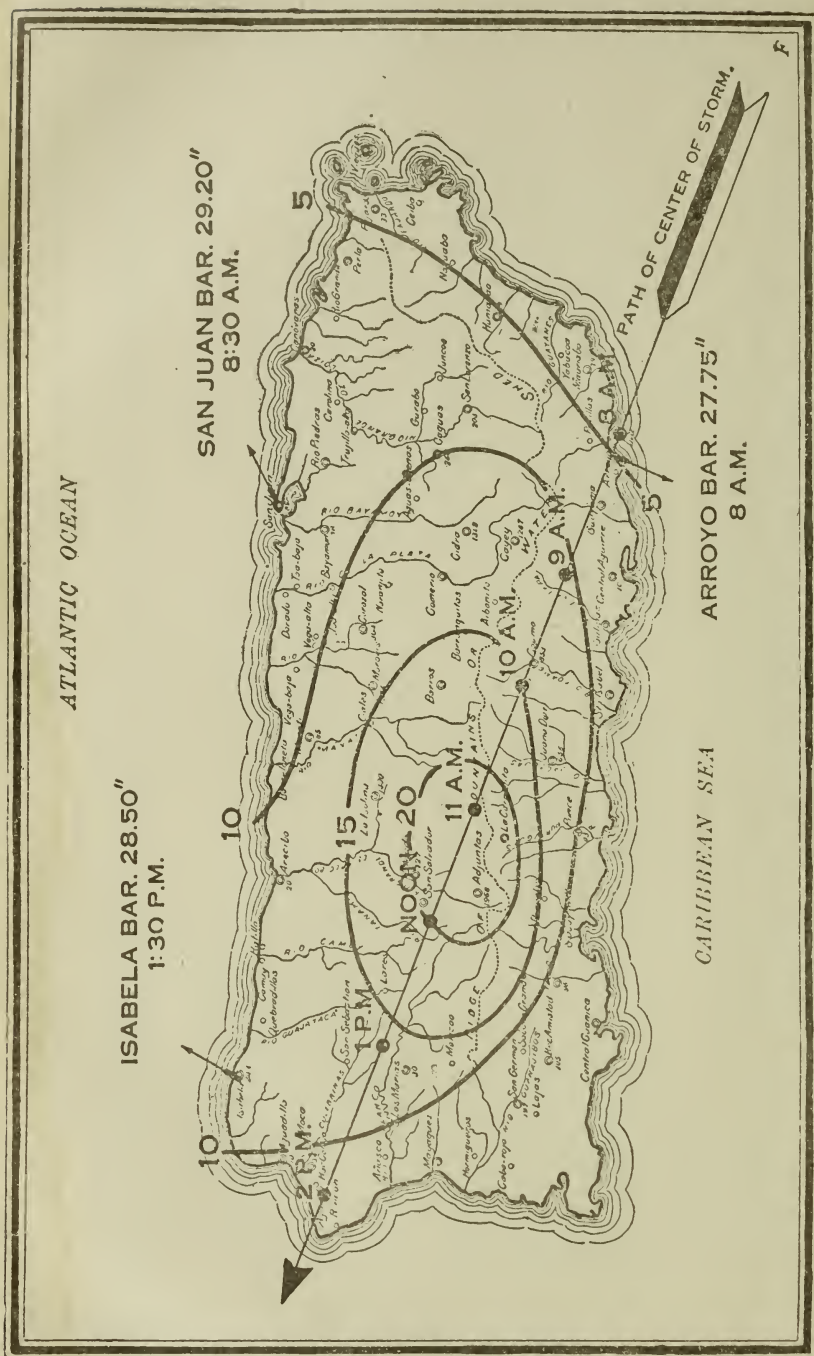
Annual Rainfall of Porto Rico in a Dry Year, 1907 (in inches)

the northeast portion of the Island; (2) the peaks about Adjuntas, near the south-central part of the Island; (3) the mountains radiating from the western extremity of the main divide, in the vicinity of Las Marias and Marieto.

The most striking feature of the rainfall distribution is the contrast between the heavy and perennial rains north of the main divide, and the light and irregular rains of the southside coastal plain. Over the north side, comprising over two-thirds of the entire Island, an abundant rainfall may be counted upon in all seasons of the year, protracted droughts being of rare occurrence; along the south coast the rainfall is not only comparatively light, but unevenly distributed throughout the year, and periods of several months with little or no rain are frequent.

There are no well-defined wet and dry seasons on the Island. The winter rains are relatively light, with a minimum in February at practically all stations. From February there is a steady increase in the average monthly amounts, amounting to 34 in. From May to November the differences in the average monthly amounts for the entire Island are small. The maximum generally falls in September along the east, in October along the south coast, in November along the north coast, while in the mountains of the interior the time of maximum occurs in one of the summer months, or as early as May. The seasonal distribution of rainfall shows a steady increase for the Island as a whole, from 11 inches in winter to 26 inches in autumn, with 16 inches for the spring months and 23 inches for the summer months, making up the total of 77 inches, in round numbers, for the average annual rainfall of the Island.

The rains of Porto Rico, while frequently very heavy, are usually of short duration. The average duration of a shower is probably not more than ten or twelve minutes, although on many occasions a series of intermittent showers will extend over a period of an hour or two. During the passage of a tropical hurricane, or when one of the more extensive North Atlantic storms passes eastward along a more southern route than usual, the period of continuous rainfall may extend to several hours and even throughout the day, or there may be several successive days of unsettled weather with frequent showers. But such storms are of comparatively rare occurrence. During the past 40 years the centers of only three hurricanes have passed over the Island of Porto Rico, although they frequently pass near enough to cause heavy rains over some portions of the Island.



Rainfall in Porto Rico During the "San Ciriaco", Hurricane of 1899
(W. B. Bol. X, pl. XVII)

The heaviest rains recorded during a 24-hour period, since the establishment of the Climatological Service of the United States Weather Bureau in 1899, occurred during the passage of the hurricane of August 8, 1899; during the rainy periods of May and November, 1909; and during the local storm of September 6, 1910. The town of Adjuntas was in the center of the path of the hurricane of August 8, 1899. The local observer reported a rainfall of 23 inches in 23 hours, the heaviest 24-hour rainfall on record in Porto Rico. There are numerous records showing a more excessive rate of fall, but for shorter periods. During the storm of September 6-7, 1910, Naguabo reported a fall of 19 inches within a period of twelve hours. There are numerous instances of a fall of 10 inches in 12 hours, while amounts of 4 to 5 inches in 24 hours are very frequent.

Rain occurs in some quantity, over some portion of the Island, practically every day in the year; it is probable that the month of February is the only month of the year having occasional periods of three or possibly four days without some rain somewhere within the Island. For the Island, as a whole, the average annual frequency, or number of days of rain yearly, is 169. At Guayama, the average annual frequency is but 66, while the number rises to nearly 300 in the Luquillo Mountains. The minimum frequency in any one year was 28, at Guánica in 1907, while the maximum has been as high at 341 at La Perla in the Luquillo Range, in 1900. The days with rainfall to the extent of 0.01 inch or more are distributed throughout the year with considerable uniformity. The average monthly frequency varies between the narrow limits of 10 to 14 in the winter months, and 15 to 17 during the period from May to November. Along the southern coast the average annual number varies from 75 to 100; along the western and northern coasts, the number exceeds 200. On the eastern slope of the Luquillo Mountains rain occurs on an average of nearly 300 days per year, as stated above, with a maximum of 341 in 1900.

OTHER FACTORS

Humidity.—The feeling of lassitude which is common to warm, moist climates is, to a great extent, dissipated in Porto Rico by the persistent flow of the trade winds throughout the day and night, supplemented by the daily play of the land and sea breezes. While the large amount of moisture in the atmosphere becomes oppressive during periods when the winds fail, it is extremely favorable to

the growth and development of vegetation throughout the year. On the dry south side of the Island the heavy dews of the night and early morning offer some compensation for the lack of rain. The high percentage of humidity also prevents the large and rapid fall of temperature during the night, so characteristic of drier climates.

Sunshine and Cloudiness.—While days with rain are frequent, and the rains are frequently heavy, there is an abundance of sunshine throughout the year in all portions of the Island.

The average cloudiness during the course of the day is remarkably uniform at San Juan. The record of hourly observations for five years shows the following variations in the proportion of sky covered by clouds from hour to hour during the course of the day, 100 per cent, representing a sky entirely overcast:

		A. M.				Noon		P. M.					
7	8	9	10	11		1	2	3	4	5	6		
47	46	45	43	42	41	42	43	45	46	48	48	per cent	

This shows the sky, on the average, to be clearest at noon, slight variations being rare.

WINDS

The Trade Winds.—Aided by the daily recurrence along the coasts of the cool, invigorating sea breeze, the *Trades* constitute a beneficent provision in the tropics for counteracting the enervating effects of a high temperature, combined with a large amount of moisture in the atmosphere. This is clearly shown during the occasional periods of a few days when the Trades fail, and light, variable winds prevail, accompanied by sultry and oppressive weather.

The value of the Trade Winds as an aid to navigation was known to the early voyagers to the West Indies. The early Spanish navigators called the Trades *brisas* while the prevailing Westerlies of the middle latitudes they named *vendavales*. In Porto Rico the variations in the direction of the wind during the course of the year are from northeast to southeast. The only variation from east-southeast (regarding monthly averages only) is likely to occur in July, August and December, when the prevailing direction is more nearly east, and in October, when it is prevailing southeast.

The *average* velocity is remarkably constant in Porto Rico, the average hourly velocity from month to month not varying more than one mile from the average of 11 miles for the entire year, ex-

cepting in July, when it rises to 13 miles per hour; and in October and November, when it falls to 8 or 9 miles.

Average Hourly Velocity and Prevailing Direction of the Wind at San Juan
(Miles per Hour)

	Jan.	Feb.	Mar.	Apr.	May	June	July
Velocity-----	11.0	11.2	11.5	11.3	10.8	12.0	12.7
Prevailing direction----	ESE	ESE	ESE	ESE	ESE	ESE	E
	Aug.	Sept.	Oct.	Nov.	Dec.	Year	
Velocity-----	11.8	9.6	7.9	9.1	10.2	10.7	
Prevailing direction-----	E	ESE	SE	ESE	E	ESE	

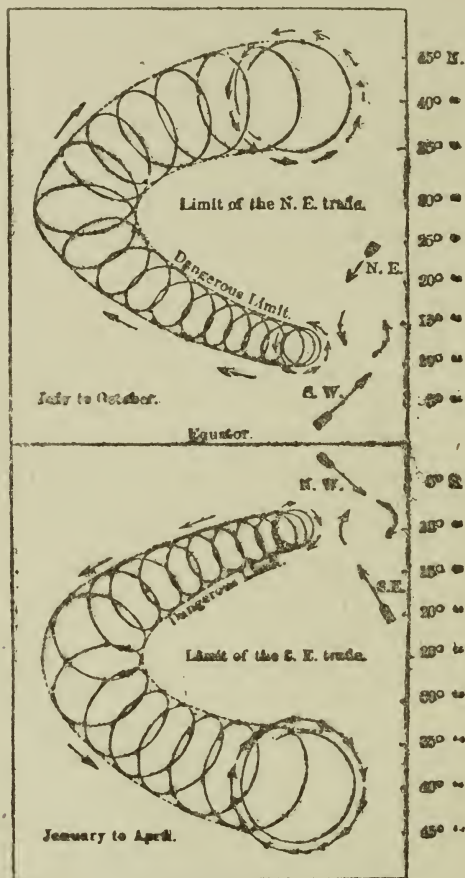
Cyclones.—Porto Rico is comparatively free from storms of all kinds. From July to October, however, that portion of the trade-winds belt containing the West Indian Islands and the Caribbean Sea is subject to occasional visits from one of the most destructive types of cyclonic storms—the West Indian Hurricane.

Cyclones¹ originate in an area of low pressure caused by the ascending current of air that follows the overheating of any region. As the air rushes in from all sides it is deflected by the earth's rotation, and assumes a rotary or whirling motion around the heated area. The centrifugal force generated by this rotation causes the barometric pressure of the area to become lower and the area to grow larger. Meanwhile the inflowing air, ascending, is chilled by the cold elevation and by expansion, sufficiently to condense its vapor rapidly. The heat energy previously latent in the vapor, is now disengaged, and causes the air to mount higher and condense still more of its vapor. It is to the energy thus rapidly liberated by the condensation of the vapor that the violence of the cyclone is due. Cyclones, therefore, acquire extraordinary violence only when an abundance of vapor is present in the air.

As the inblowing winds come near the heated area, they must blow with increased violence in order to permit the same quantity of air to pass over a constantly narrowing path. Besides the rotary motion of the wind, the storm moves or progresses over a parabolic path, which in the tropics is generally toward the west and in the temperate zones toward the east. This progressive motion of the storm is like the similar motion often noticed in a rapidly spinning top. It is due to the combined influences of the inrush of air, the earth's rotation, and centrifugal force.

¹ What follows on the subject is almost a reproduction from Houston's *The Elements of Physical Geography*.

Cyclones rage most furiously in the neighborhood of islands and along the coasts of continents. They are most powerful near their origin. As they advance, the spiral increases in size and the fury of the wind gradually diminishes, because the amount of moisture in the air is less. The rotary motion varies from 30 to 100 miles



Path and Direction of Cyclone

(From Houston's Geography, Pub. by Eldredge, New York)

an hour. The progressive or traveling motion, varying from 20 to 50 miles an hour, is least in the tropics and greatest in the temperate regions.

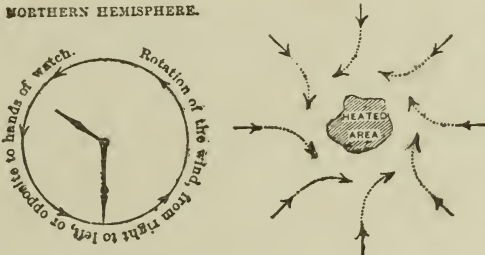
The wind rotates invariably in the same direction in each hemisphere: in the northern, it rotates counter clockwise, that is, from

right to left; in the southern, clockwise, that is from *left to right*. The cause of the regularity of rotation is due to the rotation of the earth. The wind, blowing in from all sides toward the heated area is so deflected by the rotary motion of the earth as to move in vast circles, from right to left in the northern hemisphere, and from left to right in the southern.

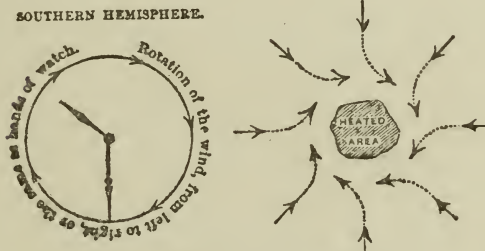
The force of the wind in these storms is tremendous. So furiously does the wind lash the water that its temperature is often sensibly raised by the friction.

The intelligent navigator always endeavors to avoid the center

NORTHERN HEMISPHERE.



SOUTHERN HEMISPHERE.



Cause of Rotation of the Winds

(From Houston's Geography, Pub. by Eldredge, N. Y.)

of the storm, since it is the most dangerous part. This he can do by remembering the direction of the rotation of the wind in the hemisphere he may be in; for if, in the northern hemisphere, he stands so that the wind blows directly in his face, the calm center is *on his right*, while in the southern hemisphere, it is *on his left*; and instead of running with the storm, hoping to outsail it, he will boldly steer toward its circumference.

The Island of Porto Rico has been visited by more than 40 recorded cyclones since its colonization started; some have been more destructive than others, according to their intensity and the manner in which they struck the Island on their path. The worst and

most recent of them occurred on the 8th of August, 1899 (*San Ciriaco*) which, with the floods consequent to it, destroyed several hundreds of human lives and several million dollars' worth of property.

V

HYDROGRAPHY

It would be difficult to find another country of its size better supplied with rivers than the Island of Porto Rico. There are more than 1,300 named streams although many run dry for several months in the year and none is large enough for commercial navigation.

The geological axis of the insular mass, as already explained, runs much closer to the southern than to the northern sea shore, and this fact, combined with the heavier rainfall in the north, because of the interposition of the curtain-like mountain system, produces the following results: (a) The northern slope has the largest rivers; (b) The rivers of the north run more constant than those anywhere else in the Island.

For the sake of convenience we shall divide the territory into four hydrographic provinces or regions: *northern, eastern, western* and *southern*, their respective boundaries being determined by the general direction of the streams.

THE NORTHERN REGION

There are six large streams deserving special mention, because of their lengths and volumes.

The **Plata** (45 miles) is the longest in the country. Its source is in the Sierra de Cayey, and so close to the divide that by means of a tunnel its head waters have been easily lead into the *Carite Reservoir*, on the southern slope, for irrigation purposes. Flowing to the northwest, and then to the north, the Plata runs across the lands of Cayey, Cidra, Comerío, Bayamón, Toa Alta and Toa Baja, entering the sea precisely east of the town of Dorado. Its main affluents are the *Guavate*, *Beatriz*, (Cayey) *Arroyato*, *Torres* and *Cancel*, all discharging on the right, and *Piedras*, *Usabón* with *Grande* and *Barranquitas*, *Hondo*, *Convento*, *Higuera*, *Doña Elena*, *Naranjito*, *Cruz* and *Lajas*, on the left. Located on this river, below the town of Comerío, is the hydroelectric plant of the **Porto Rico Railway, Light & Power Company** which supplies with electricity more than twenty towns and villages.

The **Grande de Loíza** flows from the high-lands of San Lorenzo, and passing by the east of this town, proceeds to mark the dividing line between Gurabo and Caguas; then it runs almost parallel to the Central or Military road for some distance, passes through lands of Trujillo Alto, Carolina and Loíza, discharging finally into the Atlantic, by the old town of Loíza. The main tributaries of this river are the *Cayaguas*, *Caños*, *Gurabo* with *Valenciano*, *Quebrada Grande*, *Maracuto*, *Canovanillas*, and *Canóvanas* all discharging on the right; while the *Espino*, *Turabo* with *Quebradillas* and *Beatriz* (Caguas), *Cañabón*, *Bairoa*, *Cañas*, *Quebrada Infierno* and *Cuevas* empty their waters on the left.

The **Bayamón** with its main tributaries *Guaynabo*, *Frailes*, *Santa Catalina* and *Hondo* drain the lands of Aguas Buenas, Guaynabo and Bayamón, entering the sea by Palo Seco.

The **Manatí** comes down from the uplands of Barros, the source being so close to the main divide that, as in the case of the Plata River, the head waters of the *Manatí* are lead southward through a tunnel which connects the *Toro Negro Reservoir* in the north, with the Guayabal artificial lake on the southern slope. Flowing north this river drains lands of Morovis, Ciales and Manatí, and discharges its waters into the Atlantic, precisely north and not very far from the town of Barceloneta. As explained on page 18, this river has done remarkable carving work upon its limestone bed. It has some important tributaries, among them the *Orocovis* and *Malacaña*, both on the right, and the *Bauta*, *Toro Negro* with *Matrulla*, *Cialitos* and *Magueyes* on the left.

The **Río Grande of Arecibo** has its source in the highlands of Adjuntas. It flows northward through Adjuntas, Utuado, and Arecibo, emptying into the sea just east of the last-mentioned town. This stream has done remarkable erosion work, and with its important tributaries drains a considerable portion of ground. The *Vacas*, *Cidra*, *Pellejas*, *Viví*, *Caunillas* and the *Limón* which brings in the *Yunes*, enter the river on the right; and the *Caguanitas* and *Tanamá* come in on the left, the latter disappearing by filtration and reappearing later a little above Domingo, in Arecibo.

The **Guajataca** is a good-sized stream which drains a long but narrow territory, between the Guarionex and Aymamón ranges, where the river is about to be dammed for irrigation purposes. After leaving Lares, in whose uplands the river has its source, it runs for a little distance by lands of Camuy, and marks the boundary between Quebradillas on one side and San Sebastián and Isa-

bela on the other, entering the sea by the northwest of the town of Quebradillas.

The following streams of secondary importance in the northern province, are worthy of mention:

The **Pitajaya** and **Sabana**, in Luquillo.

The **Mameyes**, flowing between Luquillo and Río Grande.

Río Grande, which with its main tributary, the *Espíritu Santo* drains a considerable part of the municipality of Río Grande, entering the ocean a short distance to the northeast of the town.

The **Herrera** which marks the line of division between Río Grande and Loíza, and discharges into the sea near Uvero Point.

The **Cibuco** is quite a river, draining with its important tributaries, the *Corozal*, *Negro* and *Morovis*, parts of the municipalities of Corozal, Morovis, Vega Alta and Vega Baja. It empties into the Atlantic a little to the north of the last-mentioned town.

The **Camuy** is a long river which in its upper course partly divides Lares and Utuado, and further down separates Hatillo from Camuy. It reaches the sea right between these two towns.

The **Los Cedros** is a small stream; it marks the western limit of the northern fluvial region, and empties into the Atlantic after separating the territories of Isabela and Aguadilla.

THE EASTERN REGION

The **Fajardo** descends from the slopes of the Luquillo mountains, drains territory of Ceiba and Fajardo, and enters the sea by the Fajardo Playa.

River Blanco flows also from the slopes of the Luquillo Mountains, drains with its tributaries the territory of Naguabo, and empties into the sea by Naguabo Port.

The **Antón Ruiz** and **Candelero** flow across Humacao lands, while the **Humacao** drains Las Piedras and Humacao territory; the three streams reach the sea by the coast of Humacao.

The **Ingenio**, **Guayanés** and **Yabucoa** come down from the eastern slopes of the Caribbean Range, and after draining the lands of Yabucoa enter the sea by the coast of this municipality.

THE WESTERN REGION

Considering the size of its rivers, this province follows the northern fluvial region in importance; in fact, some of the western streams compare favorably with the largest ones of the north.

The **Culebrinas** is a long, meandering stream, famous in history

because near its mouth, it is believed, Columbus effected his landing, in 1493; a stone monument marks the spot. This river has its source near Lares, flows then across territory of that municipality, continues across San Sebastián and Moca, and after marking the division between Aguadilla and Aguada, discharges its waters into the Mona Channel, a little to the north of the last mentioned town. Among its main tributaries are the *Collazo*, *Guatemala* and *Robles*, on the right, and *Sonador*, *Las Marías* and *Mamey* on the left.

The **Culebra** and **Santiago** rivers, which join waters immediately before reaching the sea west of Aguada, flow along the southern part of this municipality.

The **Grande de Añasco** is a large stream. Its source is in the western highlands of Adjuntas. Known as the Yahuecas in the upper course and as river Prieto, Blanco and Guasio farther down, this stream drains parts of Adjuntas, Lares, Las Marías, San Sebastián, Mayagüez and Añasco, entering the sea by the coast of Añasco. The *Guayo*, *Prieto*, *La Guaba*, *Mayagüecillo*, *Arenas*, *Casey* and *Cañas* are its main tributaries, all discharging on the left of the principal stream.

The **Yagüez** drains lands of Mayagüez, and enters the Mona Passage by this town.

The **Guanajibo** system, made by the *Esteros*, *Viejo*, *Flores*, *Buey*, *Cain*, *Hoconuco*, *Rosario* and *Hondo*, drains a considerable extent of land in the municipalities of Sabana Grande, San Germán, Hormigueros, Mayagüez and Cabo Rojo, entering the sea by the line of division between Mayagüez and Cabo Rojo.

THE SOUTHERN REGION

The rather abrupt descent from the main mountain divide to the southern shore, only ten to fifteen miles away, makes all the rivers in this province torrential in character during the rainy season, and more or less dry, stony tracts during the long, protracted droughts. The main streams of this region are the following, starting from the eastern end:

The **Jacabo** and **Patillas**, which drain the lands of the town by the latter name. The Patillas is quite a river, contributing with its main tributary the *Matón* and the *Hicacos* to form the *Patillas Reservoir*.

The **Llaurel** in Arroyo.

The **Guamaní** and **Seco**, in Guayama.

The **Salinas**, whose main tributaries are the *Majada* and the

Lapa, is a fair-sized stream which drains lands of Cayey and Salinas.

The **Jueyes** flows also across Salinas, the lower course marking the division between this township and Santa Isabel.

The **Coamo** is also a long river. Coming down from the highlands of Coamo, and receiving the affluence of several streams, it drains a good portion of the territory of Coamo, and after feeding the *Coamo Reservoir*, flows across lands of Santa Isabel.

The **Descalabrado** drains the northwestern corner of Coamo, and then separates the territory of Juana Díaz from that of Coamo and Santa Isabel.

The **Jacaguas**, in Juana Díaz, is an important stream, both in volume and length. Coming down from the uplands of Villalba, combines with its main tributary, the *Pedro García*, to feed the *Guayabal Reservoir* just south of the town of Villalba; later it takes the Cañas on the left, entering the sea between Juana Díaz and Ponce.

The **Inabón**, which receives the *Guayo* on the left, from northern Juana Díaz; the **Bucaná** with the *Cerrillos*; the **Portugués** with *Tibes*; and finally the **Canas**, all four drain the territory of Ponce. Some of these rivers, particularly the *Bucaná*, *Portugués* and *Canas* when reaching their lower courses become quite dangerous streams, during the rainy season. The city of Ponce has repeatedly been the victim of heavy floods with plenty of life and property destruction.

The **Tallaboa** has its source at Mata de Plátanos Peak in the highlands of Peñuelas; with its main tributaries, the *Guayanés* and the *Javas* drains the greater part of the territory of that municipality and then empties into the sea by Tallaboa Bay.

The **Macana** and the **Guayanilla** flow across the territory of Guayanilla, discharging into the sea by the harbor of this town.

The **Yauco** is a fair-sized stream which flows down from the Guaybaná uplands; with its main tributaries, particularly the *Duez* and the *Vegas*, it drains lands of Yauco, and after flowing across Guayanilla lands for some distance, discharges into the harbor of Guayanilla.

The **Susúa** has its source in the uplands of Yauco and Sabana Grande; it drains parts of both townships, enters Guánica, and after meandering its way empties itself into Guánica Harbor.

The **Juan Lugo**, **Plata**, **La Tea**, **Garza** and **Mamey** are small streams that flow down from the Peñones highlands, in Lajas, and

disappear, partly by discharge into the Anegado Marshes, partly by evaporation.

The **Llanos** runs down from Lajas, whose western region it drains in conjunction with its feeders, the *Galarza*, *Margara* and *Coloma* creeks, discharging finally into the sea, a little west of *Parguera*.

All the rivers of the southern hydrographic province discharge into the Caribbean Sea.

LAGOONS

Real lakes do not exist in Porto Rico, but near the seashore a number of lagoons occur. They are usually narrow and relatively long, surrounded by a dense fringe of mangrove bushes, and in some cases connected permanently with the sea, while in others the connection is only during times of heavy rains. The water in these lagoons is strongly brackish or salty, in most cases. The principal of these lagoons are **Tortuguero**, in the northeastern part of Manati, **San José**, east of San Juan, in the municipality of Río Piedras, **Tiburones** between Arecibo and Barceloneta, **Guánica**, near the town of this name, and **Joyuda**, in the northern part of Cabo Rojo.



SECOND PART

ANIMALS, PLANTS AND MINERALS

I

ANIMALS

None of the domestic or useful species found at present in the Island, such as horse, ass, donkey, ox, sheep, goat, pig, rabbit, guinea pig, cat, dog, chicken, turkey, duck, goose, etc., is indigenous of Porto Rico; some like the goat and the pig, were introduced by the Spaniards previous to actual colonization. The mouse, among the few obnoxious animals in the country, is also exotic, having found its way in vessels from other parts of the world; while the mongoose, imported for the destruction of the rats that do damage to the sugar cane plantations, proved to be perhaps worse than that plague. The mute dog to which the early chroniclers made reference was never seen by the Spaniards here, and possibly was extinct even before the Indian inhabitants.

In our classification of the animals found in the Island, other than those mentioned above, we shall observe the following order:

MAMMALS

Very limited indeed is the insular fauna in this realm. Bats, of which some six species have been counted, the Dolphines and the Sea Cows or Manatees are the only representatives.

BIRDS

Mr. Alex Wetmore writes as follows on the subject:

“As compared with corresponding latitudes in Central American and Mexico, the avifauna of the Greater Antilles is very poor in the number of species, as is usual in island groups distant from continental regions. Porto Rico is least in number of forms of bird life, a fact explained by its comparative isolation and remoteness from evolutionary centers in the large land areas. Thus far 162 species and subspecies are recorded for the region, including Porto Rico, Mona, Desecheo and the American possessions in the Virgin group, while 16 others are included as hypothetical. A number of forms recorded by Ledru (1810) are disregarded as wholly improbable; of the *bona-fide* forms, 94 breed in the Islands, 63 are visitants during migration and 5 species, perhaps resident at one time, may be called accidental. Among the resident species, 25 are peculiar to

the region under discussion (24 in Porto Rico and 1 in Mona Island) and 3, though breeding here, are absent during part of the winter season. Six have been introduced from foreign countries and are now feral or have been within recent years.

"Birds are generally more abundant on the coastal plain than inland, the swamp-loving species and water birds being confined chiefly to the neighborhood of the sea. The range of a number of Greater Antillian birds finds its most eastern extension in Porto Rico, and few forms come up through the Lesser Antilles to Vieques Island, but go no farther. Mona and Desecheo, isolated peaks on the ocean floor, are populated almost entirely by sea birds, few land birds occurring there.

"On the average, about 30 species are found in reasonable numbers during summer in almost any inland locality in Porto Rico, and a few North American migrants are added in winter. Near the coast these numbers are augmented somewhat by water birds. The species are few, but individuals, especially of dominant forms, are plentiful, though often overlooked by a casual observer because of their retiring habits and secretiveness. Certain areas are seemingly destitute of bird life, but to show that birds are more numerous in Porto Rico than is commonly supposed, two censuses were taken during the breeding season, in which accurate count was made of the number of species and individuals of each seen. On May 24 (1916), at Yauco, 391 birds belonging to 35 species were listed in four hours, in traversing a distance of 5 miles through cane fields, open and brush-filled pastures, and areas given over to small crops. Near Lares, over an area of approximately the same size, but one of coffee plantations and small farms, 335 individuals of 27 species were seen."

In the following list the corresponding local Spanish names have been added:

Grebe (2 types)-----	Zaramago, Zaramagullón, Tigua
Tropic bird (2 types)-----	Gallinaza, Gaviota, Chirre
Brown Pelican-----	Alcatraz
Booby (2 types)-----	Pájaro bobo
Man-o-War-Bird-----	Rabijuneo, Rabihoreado, Tijerilla
Heron (10 types)-----	Yaboa, Garza, Martinete
Bittern (2 types)-----	Martinete chico, Yaboa
Ibis (2 types)-----	Coco
Flamigo-----	Flamenco
Duck (12 types)-----	Pato silvestre, Chiriría, Yaguaza
Goose-----	Ganso, Guanana
Turkey Vulture-----	Aura, Aura tiñosa
Hawk (16 types)-----	Falcón, Halcón, Guaraguao, Gavilán
Osprey-----	Águila, Güinecho, Águila marina
Guinea Hen-----	Guinea
Cuban Quail-----	Codorniz
American Coot, Mud Hen-----	Gallareta, Gallinazo
Coot, Gallinule, Rail (7 types)-----	Gallareta, Pella de laguna
Limpkin, Courlan-----	Carrao
Mexican Jacana-----	Gallito

Oyster-catcher	Ostrero, Caracolero
Plover (7 types)	Playero, Pluvial, Frailecito, Chorlito
Ruddy Turnstone	Playero turco, Putilla turca
Curlew (2 types)	Curlis, Chorlo, Barga
Willet	Chorlo
Sandpiper (6 types)	Putilla, Arenero, Zarapico
Yellow-legs (2 types)	Chorlo
Marble Godwit	Chorlo, Barga
Wilson's Snipe	Becacina
Black-necked Stilt	Viuda, Playante, Yegüete, Zancudo
Laughing Gull	Gaviota, Gallego, Palomita forastera
Noddy	Gaviota, Cervera
Tern (9 types)	Gaviota
Quail-Dove (3 types)	Perdiz
Dove (Wild) (4 types)	Rola, Tórtola
Pigeon (4 types)	Paloma, Paloma turca, Torcaza
Paroquet	Periquito
Parrot	Cotorra
Cuckoo (4 types)	Pájaro bobo
Ani	Judio
Woodpecker	Carpintero
Tody	Papagayo, San Pedrito, Verdadón
Beiten Kingfisher	Martín pescador, Pitirre de mangle
Owl (2 types)	Múcaro, Coruja, Llorona
Chuck-Will's Widow	Capacho, Guabairo
Whip-poor-Will	Guabairo chico
Cuban Nighthawk	Cregüete, Querequetee, Capacho
Hummingbird (6 types)	Zumbador, Colibri
Swift	Vencejo, Golondrina
Kingbird (2 types)	Pitirre
Petchary	Clérigo
Flycatcher	Juí
Wood Pewee	Bobito, Juí pequeño
Antillean Elainea	Ruiseñor pequeño
Swallow (5 types)	Golondrina
Pearl-eyed Thrasher	Zorzal
Jamaican Mockingbird	Ruiseñor, Sinsonte
Portorrican Thrush	Zorzal
Wood Thrush	Tordo
Portorrican Crow	Cuervo
Vireo (3 types)	Bien-te-veo, Julián Chiví
American Redstart	Reinita, Candelita, Colirubio
Northern Yellow-throat	Pica-tierra
Thrush (4 types)	Pizpita
Warbler (13 types)	Reinita, Bijirita
Bananaquit Honey Creeper	Reinita, Reina, Gusanero
Finch (2 types)	Diablito, Gorrión, Chupa-arroz
Bobolink	Chambergro
Blackbird	Mariquita, Capitán

Portorrican Oriole -----	Calandria
Troupial -----	Trupial, Turpial
Portorrican Blackbird -----	Chango, Mozambique
Cow-bird -----	Tordo
Portorrican Tanager -----	Llorón, Verdoso
Portorrican Spindals -----	Reina Mora, Tomate, Llorosa
Portorrican Euphonia -----	Canario del País, Jilguero del País
Portorrican Grosbeak -----	Gallito, Churrí, Capitán, Come gandul
Grassquit (2 types) -----	Chamorro, Gorrión
Grasshopper Sparrow -----	Chamorro, Gorrión
Red Siskin -----	Dominiquito

COMMENT.—Birds are a blessing. There is so little to be said against them and so much in their favor, that the necessity for the increase and protection of the existing species and the introduction of new, useful ones, is plainly evident.

The belief held by some that birds are injurious to agriculture is absolutely groundless. In fact, the largest majority of Porto Rican birds feed on obnoxious insects, and that should make them the best friends of the agriculturist. Birds of pray are rare in the Island; the *black-bird* may eat some grain in the corn field, but the slight toll is more than compensated by the services it renders in destroying harmful pests which would do much more injury if unchecked. The legend that the local owl (*múcaro*) eats the coffee berries is not fully credited even by the *jíbaros* as can be shown by the rural rhyme:

Abre, múcaro, los ojos;
Otro pájaro te engaña;
Otro *espepita* el café,
Y tú *trepao* en las ramas!

REPTILES

There are no poisonous nor in any way dangerous reptiles in Porto Rico. Of the snake family (4 genera) there is one species of boa, harmless.

There are seven types of the *lizard* group, feeding mostly on insects and therefore deserving of protection.

Toads are represented by three species, one of them the *cohkee* (*coquí*).

Of turtles five species occur, among them the green turtle or *jicotea*, which lives in fresh water; the *morrocoyo* (box turtle) original of the savannahs of Venezuela, but now common to the Antilles; and the large type locally called *tinglado* which inhabits the sea.

FISHES

According to investigations made by the United States Fish Commission, 291 species of fish inhabit Porto Rican waters. Seventy-six families and 165 genera were represented at the time the report was made, the more common ones of the fishes being the following:

Common English names	Common local names
Mullet -----	Liza
Snapper -----	Pargo
Red Snapper -----	Pargo colorado
Snook -----	Robalo
Sardine -----	Sardina
<i>Gerridae</i> -----	Mojarra
Weak-fish -----	Corbina
Grouper -----	Mero, Cherna
Pompano -----	Pámpano
Saw-fish -----	Sierra
Thread-fish -----	Barbudo
Grunt (yellow, white, etc.) -----	Ronco (amarillo, blanco, etc.)
Hog-fish -----	Capitán
<i>Gobius</i> -----	Guavina
Eel -----	Anguila
Runner -----	Jurel
<i>Caranx</i> -----	Corcovado
Striped anchovy -----	Manjúa
Ray -----	Raya
Tarpoon -----	Sábalo
Balao -----	Balajú
Rudder-fish -----	Chupa Amarilla
Bumper -----	Casabe
Leather-jacket -----	Zapatero
Squirrel-fish -----	Candil
Fresh-water Mullet -----	Dajao
Frigate Mackerel -----	Albacora
Barraкуда -----	Picuda
Parrot-fish -----	Loro
Cutlas-fish -----	Sable
<i>Caranx</i> -----	Cojinúa
Goff-topsail -----	Palometa
Conodon -----	Bureteado
Tang, Doctor-fish -----	Barbero, Médico
Lion-fish -----	Rascacio
Big-eye fish -----	Ojón
Drummer -----	Cabezón
Moron -----	Morón

Common English names	Common local names
Banana-fish-----	Macabí
Lady-fish-----	Piojo
Puffer -- -----	Tamboril
Coat-fish, Sarmullet -----	Salmonete
Spanish Mackerel-----	Carita
Moon-fish-----	Jorobado
Trunk-fish-----	Chapín
Sea-bat -----	Murciélagó de mar

COMMENT.—The importance of edible marine stuff in the economy of any country cannot be overestimated. In connection with Porto Rico it seems enough to remark that about two million dollars go out every year to pay for the dry and canned fish imported, mainly of the cod species. The United States Fish Commission's Report mentioned before states that "The absence of extensive shoals or banks about the Island, the comparatively limited area of shallow water about the river mouths, and the fewness and small size of the bays are evidence that there can not be suitable feeding-grounds such as could support large numbers of commercial fishes." Still, more careful attention has to be given in the future to this important branch of industry, in order that the country may become as much as possible self-supporting in this respect.

INSECTS

It is said by entomologists¹ that at the present time there are some 1,500 determined species of insects in the Island, 992 species having been listed by Mr. R. H. Zwaluwenberg, in 1914 and 1915. Of the tribe, a convenient classification can be made in the following manner:

- 29 belong to the family including the *grasshopper*, *cricket* and *Katy-did*.
- 50 are of the true *bug* family.
- 73 of the group including the *leafkopper*, *scale* insects and *white flies*.
- 216 are species of the *butterflies* and *moths*.
- 5 are species of *fleas* among them the *rat-flea* carrying the bubonic plague.
- 181 belong to the *fly* family, of which some are beneficial and many are harmful.
- 270 are of the *beetle* variety, and
- 143 pertain to the family including the *bee* and the *wasp*.

¹ See Mr. John D. Moore in *The Book of Porto Rico*.

ARACNOIDEA

Speaking of Porto Rican *Spiders* and *Spider-like* animals, Stahl, the naturalist, wrote as follows in the year 1882:

"Excepting some species common to Cuba and Porto Rico, we must look to the future for further information. For the present I must frankly declare that nothing absolutely is known."

The existing species in the Island we may conveniently classify under two general divisions: The poisonous represented by only two types: the *scorpion* and the local *tarántula* called *guabá*; and the harmless spiders called *alguacil* (small, short-legged) *peluda* (hairy), *negra* (black) and the common house spiders, of which some half a dozen types occur.

Besides, the obnoxious *lick* or *garrapata*, classified as of the aracnoidea group, is found in Porto Rico.

CRUSTACEOUS

Stahl classified more than 80 different types of this group. For the sake of convenience we shall divide them in the following manner:

Crabs.—Many different types occur, of the hard and soft shell varieties, and inhabiting both salt and fresh water. *Cangrejo*, *juey jaiba*, *buruqueña* and other local denominations used for the several families of this important class of crustaceous, are modified by descriptive words such as *river*, *beach*, *mangrove*, *square*, *pointed red*, *spotted*, etc., determining the characteristic of the animal.

Lobsters and Shrimps.—Several types are found of these important species, both of the marine and the fresh-water varieties.

The **Pagurina** tribe, locally named *cobos* is represented by several species.

Myriapodes.—Two families are represented of this group: the poisonous *centipede* and the harmless *gongolí* or *gongolén*.

OTHER GROUPS

Worms.—Of this group, the only species found having a commercial value is the blood-sucking *Leach* which inhabits in some creeks, particularly in the eastern coast of the Island. Common *earth-worms* are found all over the territory.

Molluscs.—*Octopus*, *Squids*, *Oysters*, *Clams* and *Snails*, among the edible species are abundant. All along the coasts myriads of the smaller species of this group are found, waiting for intelligent

industry to give them the appreciation they deserve because of their bizarre appearance or rare beauty.

Radiated.—The most common ones are the *Sea Urchins* and the *Sea Stars* which occur in several varieties.

Polyps.—Of the many species found the *Madrepora* or *Coral Plant* deserves special mention.

II

PLANTS

Could the primitive inhabitant of old Borinquen roam freely about his island as of yore, he would be dumbfounded at the incredible changes effected since he was ousted by the white conqueror.

Surmising that our new Rip Van Winkle would not care to venture into any of the four score urban communities that now spot the Island so thoroughly, let us follow him while he spies from afar, perched on the top of some convenient heights in the mountains.

Looking towards the coast, where the thick tropical forest once reigned supreme, he would behold an almost endless fringe of yellow vegetation, in places several miles in width, and now and then he would see the regularity of the landscape broken by patches of different hues of green; but, towering above all, lovely groves of slender, beautiful fan-like trees would perhaps arrest his attention in a most particular manner——. Indeed the sugar cane, the pasture lands and the fruit estates which characterizes the agricultural transformation of the coastal plain, although perfectly strange to our Indian, would probably never appeal to his simple nature as much as the equally exotic cocoanut palm would do.

In the mountainous interior, the red skinned savage would also be greatly puzzled at the prospect. Here and there he would see small patches of well-known trees, but that would be insignificant compared with the extent of the tobacco fields, the coffee estates and the omnipresent *Musa Paradisiaca* (the Banana family) on the rugged sides of the mountains.

And perhaps his astonishment would be completed in a most disagreeable manner, when beholding the tremendous clearings effected by the ax of the *Conuco* man and the greed of the charcoal maker. Indeed, the interior of the Island appears so desolate at times, that the Indian himself would not find it a comfortable abode any longer.

The following are the most important species of the vegetable kingdom found in Porto Rico. The common local names accompany the English or technical terms in each case:

COMMON USEFUL TREES

Common English names	Common local names
Culubrina ferruginosa-----	Abejuelo
Turpinia paniculata-----	Avispillo
Satinwood-----	Accitillo
Symplocos martinicensis-----	Accituna
Laugeria resinosa-----	Aquilón
Mastic-----	Ausubo
Bamboo-----	Bambú
Wild Cocoa-tree (Literally)---	Cacao Cimarrón
Drypetes alba-----	Cafeillo
Mahogany-----	Caoba
Logwood-----	Campeche
Ocotea-----	Canela
Fiddle Wood-----	Capá blanco
Prince Wood-----	Capá prieto
Casuarina-----	Casuarina, Pino
Cedar (2 types)-----	Cedro
Cotton tree-----	Ceiba
Prickly Ash-----	Cenizo
Cherry tree-----	Cerezo
Myrcia-----	Cieneguillo
Ebony (-like wood)-----	Cóbana negra
Rain tree-----	Cóloba
Eúlacodendron-----	Coscorrón
Cork wood-----	Corcho
Ilex nitida-----	Cuero de Sapo
Coccolaba-----	Cucubano
Sarcomphalus-----	Espejuco
Lukberry tree-----	Espinillo
Yellow wood-----	Espino rubio
Flame tree (Poinciana Regia)-	Flamboyán
Lonchocarpus-----	Geno-Geno
Yellow Sanders-----	Granadillo
Ingavera-----	Guaba
Eugenia tetrasperma-----	Guasábara
West Indian Elm-----	Guásima
Trema Micranthum-----	Guasimilla
Down tree-----	Guano
Gypsy tree-----	Guaiova
Musk wood-----	Guaraguao
Guava-----	Guayabo
Lignum-vitæ-----	Guayacán
Diospyros Ebenaster-----	Guayabota

COMMON USEFUL TREES—continued

Common English names	Common local names
<i>Phyllanthus</i>	Higüerillo
Calabash, Melon tree	Higüero
<i>Coccoloba rugosa</i>	Ortegón
Wild Olive tree "Bois immor- telle" (several varieties)	Húcar blanco, etc. Huso blanco, colorado, amarillo
<i>Sapindus Saponaria</i>	Jaboncillo
Sand-box tree	Javillo
Laurel (several varieties)	Laurel blanco, amarillo, sabino
<i>Chrysophyllum glabrum</i>	Lechecillo
Lemon	Limón
Wild Cinnamon	Limoncillo
<i>Ardidia glauciflora</i>	Mameyuelo
Mahoe, Mahoe	Majagun
Mangrove (4 types)	Mangle
Santa Maria (Jamaica)	Maria
<i>Brissonia spicata</i>	Maricao
Guatemala Copal	Masa
Cabbage tree	Moca
Fustic	Mora
Spanish Elm (Jamaica)	Moral
<i>Eugenia floribunda</i>	Murta
<i>Corida borinquensis</i>	Muñeco
Orange (<i>Citrus bigadadia</i>)	Naranja agria
<i>Pseudolmedia Supuria</i>	Negra lora
Calabash Nutmeg	Nuez moscada
Lizard wood	Péndula
Bay Rum tree	Pimienta
<i>Antirrhoea coriacea</i>	Quina
<i>Casearia</i>	Rabijunco
<i>Irophis racemosa</i>	Ramoncillo
White wood	Roble blanco
West Indian Boxwood	Roble prieto
<i>Trichilia</i>	Retama
Yellow wood	Rubia
Candle wood	Tebonuco
<i>Pictelia arsitata</i>	Tachuelo
<i>Jaiti</i>	Yaiti
<i>Didymopanax morototoni</i>	Yagrumo
Lancewood	Yaya

FRUIT TREES OR PLANTS

Alligator Pear	Aguacate
<i>Hymenaea</i> (Courbaril)	Algarrobo
Almond	Almendrón ¹
Sweetsop	Anón

¹ The real Almond Tree (*Almigdalus Almigdalus*) does not grow in Porto Rico.

FRUIT TREES OR PLANTS—continued

Common English names	Common local names
Star Apple-----	Caimito
Cocoa-----	Cacao
Coffee-----	Café
Chrysophallum glaboum-----	Caimitillo
Coccolobis nivea-----	Calambreña
Cherry-----	Cerezo
Orange-----	China (Naranja dulce)
Spondias purpurea-----	Ciruela
Cocoa-nut-----	Coco, Cocotero
Bullock's Heart, Custard Apple-----	Corazón
Acrocomia Media-----	Corozo
Strawberry-----	Fresa
Pomegranate-----	Granado
Gooseberry-----	Grosello
Inga Laurina-----	Guama
Sour Sop-----	Guanábano
Guava-----	Guayabo
Medlar-----	Níspero ²
Watermelon (see below)-----	Patilla
Bread fruit-----	Pepa de pan
Pineapple-----	Piña
Banana (about 20 varieties)-----	Plátano, Guineo, Musé
Rose apple-----	Pomarrosa
Genip fruit-----	Quenepo
Watermelon (see above)-----	Sandía
Tamarind, Tamarisk-----	Tamarindo
Grape fruit-----	Toronja
Sea grape-----	Uva de Playa
Sapota fruit-----	Zapote
Mango-----	Mango

FOOD PLANTS

Anatto-----	Achiote
Garlic-----	Ajo
Sesame-----	Ajonjolí
Celery-----	Apio
Rice-----	Arroz
Sweet potato-----	Batata
Egg plant-----	Berengena
Pumpkin-----	Calabaza
Sugar cane-----	Caña de azúcar
Onion-----	Cebolla
Cabbage-----	Col
Endive-----	Escarola
Beans-----	Fríjol

² The name of the fruit is *Nísipola*.

FOOD PLANTS—continued

Common English names	Common local names
Pea-----	Gandul
Sweet Pea-----	Guisante
Lima Beans-----	Habas
Beans-----	Habichuelas
Calabas (Crescentia Cujete)---	Hedionda
Cassia Occidentalis-----	Higüera
Pawpaw-----	Lechosa
Lettuce-----	Lechuga
Lentils-----	Lenteja
Calathea Allouya-----	Lerén
Corn-----	Maíz
Colubrina reclinata-----	Maví
Peanut-----	Maní
Turnip-----	Nabo
Yam-----	Ñame
Potato-----	Papa
Cucumber-----	Pepino
Sicana Odorifera-----	Pepino angolo
Pepper-----	Pimienta
Radish-----	Rábano
Beet-----	Remolacha
Vegetable pear (Sesquium edule)---	Tayote or chayote
Tobacco-----	Tabaco
Tomato-----	Tomate
Dasheen(?)-----	Yautia
Cassava, Manioc-----	Yuca
Carrots-----	Zanahoria

MEDICINAL, USEFUL AND RARE PLANTS

Chicory-----	Achieoria
Indigo-----	Añil
Jacquinia Armillaris-----	Barbaseo
Cassia fistula-----	Caña fistula
Lantana Camara-----	Cariaquillo
Viper grass-----	Escorzonera
Guazuma Guazuma-----	Guálimo
Birthwort-----	Guaco
Castor plant, Ricino-----	Higuereta
Plumbago Scandens-----	Higuillo
Ginger-----	Jengibre
Agave, Sisal-----	Maguey
Bay Rum tree, Wild Cinnamon-----	Malagueta
Mallow-----	Malva
Calophyllum Calaba-----	María
Mimosa Pudica-----	Moriviví, sensitiva
Andropogon zizavioides-----	Pacholí

MEDICINAL, USEFUL AND RARE PLANTS—continued

Common English names	Common local names
Quararibea turbinata	Palo de Garrocha
Mucuna Pruriens	Picapica
Physalis Angulata	Sacabuche
Pluchea Odorata	Salvia
Rhoeo discolor	Sangrinaría
Sansevieria longiflora	Sansevieria, Lengua de vaca
Elder	Sáuco
Physic nut	Tártago
Opuntia	Tuna
Aloe barbadensis	Zábila
Meibomia	Zarzapaeon

FLOWER AND ORNAMENTAL PLANTS

Rose-bay	Adelfa
Brunfelsia americana	Aguacero
Blumeria rubra	Aleli
White Lily	Azucena
Clerodendron Thomsoni (a creeper)	Bandera danesa
Canna	Bandera española
Antigon leptopus	Bellísima, vellocina
Ipomoea quamoclit	Cambustera
Thunbergia erecta	Campanilla
Allamanda cathartica	Canario
Carnation	Clavel
Caesalpinia pulcherrima	Clavellina
Poppy	Anapola, Candela, Pavona
Mignonetter, reseda	Conculita, Reseda, Lluviniaoro
Codiaeum variegatum (many types)	Croto
Dahlia	Dalia
Sestrum nocturnum	Dama de noche
Zephranthes rosea	Duende
Zinnia	Escopeta
Caesalpinia gilliesii	Espiga de amor
Impatiens balsamina	Espuela de galán
Eichornia crassipes	Flor de agua
Saguaro, tree-cactus	Flor de mayo, Pitahaya
Euphorbia pulcherrima	Flor de Pascua
Panaxa fruticosa	Gallego
Gardenia	Gardenia
Geranium	Geranio
Sun-flower	Girasol
Gladiolus	Gladiolo
Fern (many varieties)	Helecho
Plumbago capensis	Isabel Segunda

FLOWERS AND ORNAMENTAL PLANTS—continued

Common English names.	Common local names
Hyacinth-----	Jacinto
Jessamine (several varieties) --	Jazmín
Hibiscus serizopetalus -----	Lira
Lily (many varieties)-----	Lirio
Russelia Junea -----	Lluvia de corales
Duranta plumier-----	Lluvia de lilas
Honey-suckle -----	Madreselva
Cana-----	Maraca
Daisy-----	Margarita
Murrraya exotica-----	Mirto, Café de la India
Daffodil-----	Narciso
Whitlow-wort -----	Nevado
Tabernaemontana coronaria-----	Novia
Caladium bicolor-----	Paleta de pintor, Cara caballo
Quiscualis Indica -----	Quiscual, Coquiza, Dondiego
Stenolubium stans -----	Roble amarillo
Rose (many varieties)-----	Rosal
Mirabilis jalapa -----	Siciliana, Maravilla del Perú
Everlasting, Immortelle -----	Siempreviva
Bougainvillaea -----	Trinitaria
Tulip -----	Tulipa
Porana racemosa -----	Velo de novia
Petraea volubilis -----	Viuda, Guinda
Violet-----	Violeta

III

MINERALS¹

Gold.—Gold mines were worked for some years by the Spaniards in the first century of the conquest, and according to official statistics, 2,700 pounds of gold were sent to Spain from the year 1509 to the year 1536. It is believed that the figure only represents the part belonging to the Crown of Spain—that is to say, the fifth of the total production during that period of time.

It is known that the watershed of the rivers Corozal, Negros, Congos, Cibuco, Mavilla, and Manatí contain gold-bearing sands. Near the source of the Congos River, in the bed of it, and 25 centimeters deep, some pieces of quartz have been found containing from 8 to 10 grams (123 to 154 grains) of pure gold. In the jurisdiction of Corozal some washing machinery was established, and the result was from \$2.17 to \$4.30 for each ton of sand.

¹ The chapter is almost a reproduction from *Geological Reconnaissance of Porto Rico*, by Mr. Charles P. Berkey.

There are also, according to official information, some gold placers in Mayagüez, San Germán, Yauco and Coamo. The gold is found in grains or nuggets worth \$2 or \$3, and rarely, nuggets of even higher value. In the Fajardo River a piece was found which weighed 4 ounces, and in the Congos another piece of one pound was also found; but the biggest piece of pure native gold was discovered in the lands belonging to Mr. Bou, in the jurisdiction of Corozal. That piece was sold to Mr. Bou by the finder for \$200 in money and some other valuables. In the bed of the Filipina rivulet there were obtained from 60 kilograms (132 pounds) of sand six-tenths of a gram (9 grains) of pure gold, which makes 10 grains (154 grains) for one ton of sand. The enterprises mentioned were abandoned, and the only work on the mines was done by the *lavadores* or washmen. They used an instrument called "*gaveta*" made of wood, shaped like a plate, 40 centimeters in diameter and 12 centimeters deep. In the watersheds of the Mameyes River and in all the rivers crossing the jurisdiction of Corozal, numbers of peasants can be seen engaged in the work of washing gold-bearing sand, from which they obtain gold in amount sufficient to pay their support.

Copper.—The minerals of copper obtained are: iron-bearing motley copper, native copper, green and blue carbonates, yellow copper sulphide, often accompanied with iron pirites and iron oxides. Spanish explorers of the Island paid little or no attention to copper. It is generally found along the main chain of mountains dividing the Island from east to west, from the neighboring island of Vieques, and then following through Río Blanco, Gurabo, Corozal, Ciales, Jayuya, Maricao, and some other places such as Las Piedras, Humacao, Ponce Piñalejo, which belong to the southern chain of mountains, and also in the vicinity of the road from Caguas to San Juan, the richest place being the *barrio* of Río Blanco, in the municipality of Naguabo. The first works for the exploitation of copper began in 1869. In the mine named "La Abundancia" some small excavations were made, and the superficial carbonate was gathered, and many tons of rich mineral were thus obtained. Like results were reached in the mines named "Santa Amalia", "La Castellana" and "Santa Teresa", all located in the *barrio* of Río Blanco. In the last-named mine copper indications were noted from the surface to a depth of 25 meters, first as green carbonate with 23 per cent of copper, then as iron-bearing motley copper, and in some parts, very pure yellow sulphide. In 1879 ten tons of copper

sulphide were obtained from the mine "Santa Teresa", and sixty tons of carbonate of copper from the "Santa Amalia". Owing to the difficulties and high prices of transportation work ceased.

Silver.—The existence of silver in the Island has been officially recognized. On July 19, 1538, the "Oficiales Reales" wrote to the King of Spain that "veins of lead containing some silver have been found" and on March 29 of the following year they wrote "With respect to the silver mines here discovered, we arranged that the mineral be fused here, but there is no person who knows how to do it. In some places veins of that metal have been found, but nothing has been done, waiting the arrival of some one who knows how to fuse and work it". In the History of Porto Rico by Fray Iñigo Abad, with notes by Don José Julián Acosta, the statement is made that in the *Serranía de Añasco* there was a mine containing silver; and in a report prepared in 1879 by the chief engineer of the bureau of mines, reference is made to certain samples of silver found in the *barrio Llanos*, of the municipality of Isabela. In other official documents the existence of silver in the northwestern part of the Island is affirmed.

Lead and Silver-Bearing Minerals.—The existence of lead deposits in several parts of the Island is officially reported. In Guayama, at *barrio del Carmen*, a mine of silver-bearing lead was actually exploited up to a few years ago. There is no doubt that the mineral exists there in sufficient quantity to pay mining it. Good samples of galena have been found at Arroyo, Mayagüez and Naranjito.

Iron.—Magnetic iron of excellent quality exists in many places, particularly in the eastern sections of Porto Rico. The more important deposits are at Las Piedras, Humacao, Juncos, Gurabo, Naguabo, San Lorenzo, Patillas, and Arroyo, where the mineral has been found to contain at times over 60 per cent of metal. Deposits also occur at Utuado, Jayuya, Mayagüez, and undoubtedly in many other parts of the Island.

Manganese.—Two mines have been actually in exploitation during the past, one at Juana Díaz and the other at Corozal. The element is not at all exhausted, but economic difficulties of some kind makes its mining at present a rather hazardous venture.

Coal and Oil.—There is no good ground for believing that valuable deposits of these products exist in Porto Rico. The only basis for the hope of finding coal in the Island is the occurrence of *Lignite* and lignitic material in several northern central or western

localities, from Corozal to Moca, but more particularly in Utuado, San Sebastián and Lares.

Marble.—Dr. Stahl speaks of the marble existing at Naguabo, remarking that its quality is not inferior to the Carrara stone, of world fame. Fine marble actually exists at Trujillo Alto, Guaynabo, Caguas and Ponce.

Granite.—Existence of this material has been reported from the eastern part of the Island, particularly at the Luquillo range; Stahl calls the Yunque a "colossal mass of granite," and there is no doubt that it exists in some variety, with the syenitic rocks and masses of porphyry. Most excellent building stone blocks may be quarried at Juncos, San Lorenzo, Humacao and Gurabo.

Limestone.—This material is abundant in Porto Rico, especially in the northern part of the Island. A particularly fine grade is obtained from the small island of Iicacos, just off the northeast coast, for use in sugar refining; but the range of the mineral in quality and structure is great, and its uses are equally numerous in road and building construction, etc.

Gypsum.—In Ponce and Manatí there exist deposits of this material. Nothing has been done to exploit them.

Clay.—Fine quality of clay is found in many parts of the Island, its use being for the making of bricks, tiles, and rough ceramic articles.

Kaolin.—This is the material used in the manufacturing of porcelain; the deposits of it found in Yauco, and Arroyo have been under exploitation, but not to any large extent.

Phosphate rocks.—The material occurs at Cabo Rojo, Manatí, Isabela and Ponce.

Salt.—The production of salt in Porto Rico is confined exclusively to the southern coast, and the process of solar evaporation, in its most primitive form is the only one employed. The main sources exist at Cabo Rojo, Lajas, Yauco and Salinas.

Guano.—Fertilizing Bat Guano in considerable quantities, is found in many caves in Porto Rico.

Mineral Springs.—There are four widely known mineral springs in Porto Rico, the waters of each contain medicinal properties of no mean value. These springs are located at Baños de Coamo, Baños de Quintana (Ponce), Arroyo and Caguas.

THIRD PART

THE PEOPLE

I

WHAT THE CENSUS SHOWS

In the year 1920 there were in Porto Rico 1,299,809 souls, and to-day (1925) the population must reach to nearly 1,400,000. Dividing the figure by 3,435, which is the total number of square miles measured by the territorial area, it will be found that the country is thickly settled, but by no means the most populous land in the world, as many people think. The following figures will illustrate the point by comparison:

Country	<i>Sq. miles</i>	Population	
		<i>Total</i>	<i>To the sq. mile</i>
Barbados -----	166	192,000	1,151
Belgium -----	11,400	7,600,000	666
Corsica -----	3,366	295,589	87
Jamaica -----	4,297	891,000	209
Porto Rico -----	3,435	1,400,000	400
Salvador -----	7,225	1,300,000	179

That the increase in population has been steady since the time in which the first census was taken can be seen by the following table:

Year 1765 -----	44,883 inhabitants
Year 1775 -----	70,250 inhabitants
Year 1800 -----	155,426 inhabitants
Year 1815 -----	220,892 inhabitants
Year 1832 -----	330,051 inhabitants
Year 1846 -----	447,914 inhabitants
Year 1860 -----	583,303 inhabitants
Year 1877 -----	731,648 inhabitants
Year 1887 -----	798,565 inhabitants
Year 1899 -----	953,243 inhabitants
Year 1910 -----	1,118,012 inhabitants
Year 1920 -----	1,299,809 inhabitants

From 1910 to 1920 the rate of increase was a little over 16½ per cent.

The belief also held by some outsiders that Porto Rico is a country of negroes, like several islands of the West Indies, is equally without foundation. There are indeed negroes in the Island, but the proportion of the blacks to the whole of the population is considerably lower than in any other West Indian island or country and really insignificant when compared with some of the southern States. The following figures will illustrate the matter:

Country	Population	White	Colored
Alabama-----	2,348,174	1,447,032	900,652
Cuba-----	2,900,000	2,090,000	800,000 ¹
Georgia-----	2,895,832	1,689,144	1,206,635
Haiti-----	2,000,000	None	-----
Jamaica-----	891,000	20,000	871,000
Mississippi-----	1,790,618	853,962	935,184
South Carolina-----	1,683,724	818,538	864,719
Porto Rico-----	1,299,809	948,709	351,062
Santo Domingo-----	700,000	150,000	550,000

Of the colored Porto Ricans 49,246 were pure black and 301,816 mulattoes. Besides, in 1920, there were in the Island 32 Chinese, 4 Japanese, 1 Filipino and 1 Hindu.

Distributed by sexes, the population was as follows:

Males-----	647,825
Females-----	651,984

By nationalities the population of Porto Rico was mainly distributed thus:

Citizens of the United States-----	1,286,293
Citizens of Porto Rico-----	522
Citizens of Spain-----	8,858
All other-----	4,136

Indications point to a rapid increase in the proportion of urban population for the future, but the Island is still preeminently rural, considering as rural also those communities under 2,500 inhabitants. The census shows that a little over 78 per cent of the people live in rural communities, and only 22 per cent in cities or towns. There is only one city of over 50,000, one of more than 25,000, four of 10,000 to 20,000, and 26 have between 2,500 and 10,000 inhabitants.

¹ Excluding the foreign white—260,000—the proportional result would be entirely different. The pure negroes in Cuba numbered 323,000 according to the official census of 1919.

By age, this is the distribution given by the census:

Under 5 years-----	200, 255
5 to 9 years-----	195, 131
10 to 14 years-----	168, 054
15 to 19 years-----	126, 248
20 to 44 years-----	441, 128
45 years and over-----	168, 696
Age unknown-----	297

Regarding illiteracy, although considerable progress has been made toward its eradication, the census still shows a heavy percentage of persons over 10 years of age unable to read. The exact figures are these:

Number of persons 10 years and over-----	904, 423
Number of them unable to read-----	497, 089
Percentage of illiterates-----	55

About one-third of the inhabitants of Porto Rico are actually engaged in gainful occupations, the general division being as follows:

Agriculture, forestry and animal husbandry-----	245, 000
Clerical occupations-----	5, 200
Domestic and personal service-----	40, 000
Extraction of minerals-----	200
Manufacturing and mechanical industries-----	72, 000
Professional services-----	7, 000
Public service (not elsewhere classified)-----	4, 400
Transportation-----	10, 000
Trade-----	26, 000

In the professional occupations we shall mention the following:

Actors and showmen-----	90
Architects-----	20
Artists, sculptors and teachers of art-----	24
Authors, editors and reporters-----	57
Chemists, assayers and metallurgists-----	154
Clergymen-----	297
College presidents and professors-----	32
Dentists-----	118
Designers and draftsmen-----	31
Lawyers, judges and justices-----	390
Musicians and teachers of music-----	369
Photographers-----	87
Physicians, surgeons and veterinarians-----	456
Teachers-----	3, 742
Technical engineers-----	265
Trained nurses-----	393

COMMENT.—The situation of Porto Rico in connection with the steady increase of the population is indeed serious, but by no means desperate or without remedy. The true economist should see no cause for alarm, but simply an interesting problem which can and should be solved in a satisfactory manner, and without recurring to extreme measures. It is a fact that living costs *less* and agricultural production must be *more* in tropical than in cold countries, inasmuch as, with intensive methods and an intelligent rotation crop system, the land can be made to produce greatly more where winter is unknown. In the Tropics, education must take the place of the natural incentive for work which there is in cold climates, and therefore the solution of the problem of increasing population in Porto Rico must be found in a *higher level of culture*, at least for many generations to come.

II

CULTURE AND CHARACTERISTICS

Porto Rico was discovered by Columbus in 1493, and remained a Spanish colony for 405 years, or until 1898. The aboriginal savages—Indians—were partly exterminated, and the rest merged with the African negroes, imported as slaves, and with the Spanish element, which is the predominating one to-day, and whose language,¹ religion and customs gave the country its special type of Spanish culture. Being offspring of a Latin nation, Porto Rico has basic characteristics in common with the mother land, due allowance being made for those modifications which result from climate, distance, and, lately, by the influence of the great American Republic in whose possession the Island has been for the last 25 years.

Whatever the opinion may be in other respects, all observers are agreed upon the following characteristics as natural of the islanders.

Individually and as a people, when their passions are roused they are brave to rashness. All the invaders in the past, whether English, Dutch or French found the islanders more than ready to throw them off. By 1898 deep, bitter political strife with the mother country had made the Porto Ricans skeptical, and the American army of General Miles was not looked upon as an intruding enemy but as the delivering friend from reactionary misrule.

¹ No Spanish dialect, but Castilian, the national language of Spain, is the vernacular of Porto Rico.

Foreigners are often struck with the cordiality shown by the Porto Ricans to all strangers in their land. The true Porto Rican readily admits a new friend into society and home. In the country side the poorest *jibaro* is always willing to share his cup of coffee and plantain (in place of bread) with any passer-by, and go long-ways in serving him. Like the true Castillian, politeness is the common mark of good breeding in the Porto Ricans. Loquacious and affable, the average genuine Porto Rican could hardly understand the meaning of modern snobism.

Boundless generosity, reflected indeed from his tropical surroundings, is as natural in the Porto Rican as calculated prudence may be of other races. His property, his happiness, his very life will be easily pledged by the true son of Porto Rico in behalf of the friend, cause or principle, once he is convinced that the trust is a deserving one.

And he is improvident, too. The native of this charming Island has yet to learn the hard lessons of industry and thrift. It is true that social injustice, as a natural sequel to cruel political conditions, has kept the native down and denied him, by selfish discrimination, the natural chance for a fair struggle for existence. But whatever the causes may be, it is a fact that out of the wealth of the Island not over fifteen per cent, belongs to native Porto Ricans. This is, indeed, one of the most serious drawbacks in the development of Porto Rico for the Porto Ricans primarily.

The economy of the country is based principally on agriculture, and in this connection it will be pertinent to repeat here what Professor Dryer remarks¹:

"In *plantation culture* special crops, such as cotton, sugar cane, coffee, tea, and rubber, are grown on large tracts. The laborers are often of inferior native or imported races, and under some form of servitude; ownership and control being in the hands of foreign proprietors with large capital.

"This is the only practicable way, it is said, of utilizing the labor supply and developing the agricultural resources of tropical countries. Natives of such countries will not work steadily even for large wages, and are made to work, if at all, under some form of compulsion. White men, as a rule, cannot work in tropical countries; the proprietors find, therefore, that forced native labor or none at all are the only alternatives."

The above statements may not all apply strictly to Porto Rico, since the population of the Island is not of so-called inferior stock, but predominantly white. Nevertheless it is a fact that the agri-

¹ From *High School Geography*, copyright 1911, 1912, by Charles Redway Dryer; copyright, 1920, 1924, by American Book Company, Publishers.

culture of the country is of the *plantation type* described, and that the population is sharply divided into two distinct, easily detected social classes; the educated few above, and the masses of the common people below.

Education is changing those conditions rapidly, and there being no race prejudice in Porto Rico, to the bitter extremes existing in other countries, it is only a question of a comparatively short time when the island people will be a really homogeneous family with common ideals and an equal general level of culture, as it becomes a modern democratic community.

III

GOVERNMENT

The United States of North America is a Federal Republic whose government consists in three well-balanced departments: the Executive Power, exercised by a President, assisted by a body of secretaries collectively known as "The Cabinet"; the Legislative Branch, (Congress) made up of two chambers, the upper one being the Senate and the lower the House of Representatives, or "The House" as it is simply called; and the Judicial power made up of the Federal Supreme Court (9 justices) assisted by nine Circuit Courts of Appeals, and eighty-one District Courts.

Porto Rico has been a dependency of the United States since the year 1898, and by a law of the Congress (Jones Act, 1917) enjoys a civil government roughly embodying the main features of those American territories outside the federal union. There exist, consequently, and operate along two perfectly defined lines, two distinct governments in the Island: the Federal or National, and the Insular or Local Governments.

THE FEDERAL GOVERNMENT

The three branches control their respective activities, as follows:

Congress, by actual legislation relative to the Island's affairs, or by measures of a general character having also application to Porto Rico. The Island is especially represented in Congress by a **Resident Commissioner**, popularly elected in Porto Rico every four years, and who by courtesy of the House of Representatives has a seat in that chamber, where he is permitted to speak on matters which deal solely with Porto Rico, but he has no vote.

The **Judicial Branch** of the Federal Government is actually

represented in the Island by the Federal District Court sitting at San Juan, under the immediate jurisdiction of the Circuit Court of Appeals, of Boston.

The **Federal Executive** controls through its various departments in the following manner:

The **War Department** directs all the military activities. At present the armed land forces consist of one regiment of infantry, of the regular army, stationed at the posts of San Juan and Cayey, and another regiment of National Guard infantry whose company units are distributed throughout the Island; the latter meet frequently for drilling, at regular training camps, where intensive training is kept up for continuous periods of several weeks. Both regulars and guardsmen constitute military organizations of the highest order.

The War Department, through its Bureau of Insular Affairs, has actual supervision of all the major activities of the Insular Government.

The **Navy Department** has charge of all the naval establishments in the Island, its main activities being the large governmental wireless plants in San Juan and Cayey. The island of Culebra has been many times in the past the rendezvous of the war fleets during the naval manoeuvres in the Atlantic Ocean and Caribbean Sea and it is possible that in the near future a great permanent first-class naval station will be established there.

The **Post Office** has charge of all the mails in Porto Rico, there being at present nearly one hundred post offices in the territory.

The **Treasury Department** conducts the Federal Land Bank, the Custom House and Coast Guard services and, besides, other miscellaneous duties, such as the planning of all the federal buildings in the Island, etc. The American gold standard, highest in value throughout the world, is the currency of Porto Rico.

The **Department of Agriculture** conducts the Weather Bureau at San Juan, the Seismographic Station at Vieques Island, and agricultural stations for the advancement and improvement of this science.

The **Department of the Interior**, through its National Park Service, has charge of the Luquillo National Forest.

The **Department of Commerce** conducts the Census; it is taken once every ten years. The same department directs through its various divisions all the activities connected with the fisheries,

coast and geodetic survey, and commercial navigation, having charge of the lighthouses, steamboat inspection, etc.

Many other federal activities, such as the American National Red Cross, scientific investigations, vocational education, etc., are carried on either continuously or occasionally, as the case may be, by the Federal Government, through its various divisions or by the mentioned departments. As the Island is being assimilated by the Nation, its activities extend to the territory more and more every year.

THE INSULAR GOVERNMENT

The Organic Law (Jones Act) provides for a government made up, like the National Government, of three distinct branches: the Executive, the Legislative and the Judicial.

The *Executive Power* is exercised by the Governor, who is appointed by the President of the United States with the advice and consent of the Federal Senate. The Governor has general supervision and control of all the departments and bureaus of the Government of Porto Rico, subject to the provisions of the Organic Act.

The Organic Act provides for the following executive departments: **Justice, Finance, Interior, Health, Education, and Agriculture and Labor**. The respective titles of the heads of these departments are: **Attorney General, Treasurer, Commissioner of the Interior, Commissioner of Health, Commissioner of Education, and Commissioner of Agriculture and Labor**. These jointly constitute the Executive Council. The Organic Act provides also for an **Executive Secretary**, appointed by the Governor and confirmed by the Senate of Porto Rico.

The *Auditor of Porto Rico*, another important administrative official, is appointed by the President of the United States. In the same manner are appointed the Commissioner of Education and the Attorney General. The other four departmental heads are appointed by the Governor of Porto Rico, with the advice and consent of the Insular Senate.

The six heads of the executive departments, the Auditor and two other members elected by the qualified voters of Porto Rico, constitute a **Public Service Commission** whose functions are to grant franchises, rights and privileges of a public or quasi-public nature, subject to the approval of the Governor and the subsequent

ratification or annulment by Congress. The Executive Secretary is ex-officio Secretary of this Commission.

The Attorney General, as the head of the Department of Justice, performs all the judicial functions of an attorney in a Territory of the United States.

The duties of the Treasurer, as the head of the Finance Department, are all those related to the collection, keeping and payment of all public funds, having also the power to examine and supervise banks, insurance and other financial corporations, etc.

The Commissioner of the Interior superintends all works of a public nature, having charge of all public buildings, grounds and lands, etc., except those belonging to the United States.

The Commissioner of Education, as the title implies, has charge of all the public educational activities in Porto Rico.

In the same manner, the duties of the Commissioner of Agriculture and Labor are to foster, promote and develop the agricultural interests and the welfare of the wage earners of Porto Rico, "to improve their working conditions and to advance their opportunities for profitable employment."

The Commissioner of Health has general charge of all the health and sanitation of the Island, supervising, administering and controlling all the charitable institutions supported by insular funds.

The Auditor of Porto Rico checks all public expenditures; the jurisdiction of this official over accounts whether of funds or of property, and all vouchers and records pertaining thereto, is exclusive.

The Executive Secretary records and preserves all acts of the Public Service Commission, the laws enacted by the Legislature, and all acts and proceedings of the Governor. He promulgates all proclamations and orders of the Governor and all laws enacted by the Legislature, etc. Under the superior direction of this official are also the bureaux of Weights and Measures and of Supplies, Printing and Transportation, whose respective importance is disclosed by their titles.

The **Judicial Power** comprises a Supreme Court composed of five judges—one Chief Justice and four Associate Justices—a *fiscal* or prosecuting attorney, a marshal, a secretary and other minor officials. The five judges are appointed by the President of the United States with the advice and consent of the Federal Senate. These judges hold office for an indefinite term.

The Island is divided into seven *judicial districts* with headquarters as follows: San Juan, Humacao, Guayama, Ponce, Mayagüez, Aguadilla and Arecibo. Except at San Juan, where there are two judges, each presiding over a separate division, each district court consists of one judge, a *fiscal*, a marshal, a secretary and minor officials and employees.

The Municipal Courts consist of a judge, a secretary and a marshal; while the Courts of Peace generally found in the larger towns consist of a justice of the peace, a secretary and a bailiff.

Judges, prosecuting attorneys (*fiscales*) secretaries and marshals are all appointed by the Governor with the advice and consent of the Insular Senate, except in the case of the courts of the peace, where the secretaries and bailiffs are appointed by the respective judges themselves.

The **Legislative Power** consists of two chambers: the Higher or **Senate**, and the Lower or **House of Representatives**; the lower house is usually called the *Cámara*. The Senate is composed of 19 members, two elected by each of the seven senatorial districts in which the Island is divided—corresponding to the judicial districts—and five being senators-at-large, *i. e.*, the five candidates receiving the largest number of votes.

The House of Representatives is made up of 39 members. The Island is divided into thirty-five representative districts, there being besides four representatives elected at-large.

The territorial division into Senatorial and Representative districts is as follows:

First Senatorial District

Representative Districts:

1. San Juan, except Santurce
2. Santurce
3. Río Piedras, Trujillo Alto and Carolina
4. Bayamón and Guaynabo
5. Toa Alta, Naranjito, Corozal and Toa Baja.

Second Senatorial District

Representative Districts:

6. Vega Baja, Vega Alta and Dorado
7. Manatí and Barceloneta
8. Ciales and Morovis
9. Arecibo
10. Utuado, except barrio Consejo.

Third Senatorial District

Representative Districts:

11. Camuy, Hatillo and Quebradillas
12. Aguadilla and Isabela
13. San Sebastián and Moca
14. Lares, Las Marías and Maricao
15. Añasco, Aguada and Rincón.

Fourth Senatorial District

Representative Districts:

16. Mayagüez
17. Cabo Rojo, Hormigueros and Lajas
18. San Germán and Sabana Grande
19. Yauco and Guánica
20. Guayanilla and Peñuelas.

Fifth Senatorial District

Representative Districts:

21. The *barrios* Primero, Segundo, Tercero, Cuarto, Quinto and Sexto of the city of Ponce
22. All of the municipality of Ponce, except the stated *barrios*
23. Adjuntas and Jayuya, and the *barrio* Consejo of the municipality of Utuado
24. Juana Díaz and Santa Isabel
25. Coamo and Barros.

Sixth Senatorial District

Representative Districts:

26. Aibonito, Barranquitas and Comerío
27. Cayey and Cidra
28. Caguas and Aguas Buenas
29. Guayama and Salinas
30. Patillas, Maunabo and Arroyo.

Seventh Senatorial District

Representative Districts:

31. Humacao and Yabucoa
32. Juncos, Gurabo and San Lorenzo
33. Naguabo, Ceiba and Las Piedras
34. Fajardo and Vieques and the Island of Culebra
35. Río Grande, Loíza and Luquillo.

The laws passed by the Legislature of Porto Rico are subject to the approval or to the veto of the Governor of Porto Rico or of the President of the United States, as the case may be, in accordance with the provisions of the Jones Act, which clearly defines also the scope and power of the legislating body.

The Municipal Government in Porto Rico is regulated by the Municipal Law passed by the Legislature of Porto Rico, in 1919. The 76 townships are divided into three categories: *first class*, all municipalities whose assessment reaches or exceeds eight million dollars; *second class*, all municipalities whose assessment reaches or exceeds three million dollars but does not reach eight million dollars; *third class*, all other municipalities. This classification is revised every four years, and the composition of the municipal government is determined by the category of the township.

Elections in Porto Rico are held every four years on the first Tuesday after the first Monday in November. Every male citizen of the United States, of the age of twenty-one years or over on the day of the election has a right to vote, provided he is not legally disqualified.

COMMENT.—The marvelous political progress of Porto Rico during the last quarter of a century could be compared only with the material strides made by the country during the same period. Great indeed is the difference between the personal rule of the royal representatives in the old Spanish colony and the present rule of this commonwealth where no day passes without the people learning the lessons of democracy and self-reliance.

IV

RELIGION

The state religion of Spain being the Roman Catholic, all Porto Ricans were practically of this faith in the year 1898, when the change of sovereignty occurred. Under the Spanish régime, and in accordance with the constitution of Spain, freedom of worship was recognized in the Island, and when the Americans occupied it, a few Protestant religious institutions were at work in Porto Rico.

The Roman Catholic Church.—Though by virtue of the change of sovereignty, in 1898, the Roman Catholic Church lost the support of the State, since that year remarkable progress has been made by Catholicism and its institutions in Porto Rico. At present the See of Porto Rico is directly subject to the Pope through an Apostolic Delegate who resides in Havana. According to the latest data, under the superior direction of the Bishop of Porto Rico there are in the territory 13 vicariates and 89 parishes with 128 priests in all, 62 of which belong to the following religious orders:

Augustinians, Carmelites, Capuchins, Dominicans, Lazarites and Redemptorists. The Church directly conducts 8 hospitals, 5 asylums or homes and 1 school for the deaf and dumb. There are the following orders of women: Mesdames of the Sacred Heart, Carmelites, Dominican Sisters, Franciscan Sisters of the Third Order, Daughters of Charity, Mission Helpers, Servants of Mary and Little Sisters of the Poor. Finally, there is a Seminary where students are prepared for the priesthood.

The Roman Catholic Church conducts a number of educational institutions in the country.

The Protestant Church and its Activities.—The oldest Non-Roman Church in Porto Rico is the "Church of the Holy and Ever Blessed Trinity", erected in Ponce, in the year 1873. In 1898 the Archbishop of Canterbury, in accordance with the policy of the English Church, transferred the church and its congregation to the American Episcopal Church, under whose jurisdiction it continues.

Immediately after the American occupation, the "Church of Jesus", a religious communal institution, was founded at Quebrada Limón. Since then, the work of the Protestant Church in the Island has been effectively progressive, the Evangelical Union and other denominations contributing in a great measure to the spiritual and mental uplift of their members, through their numerous churches, schools, charitable institutions, periodicals, etc. To-day Protestantism is an active force in every town of Porto Rico, there being a number of important institutions in charge of the work. The mission work is conducted by some ten different denominations; the Episcopal bishop for Santo Domingo, Porto Rico, and the Virgin Islands has his official residence in San Juan.

V

EDUCATION

If all the school pupils of Porto Rico could parade before us, in regiments of one thousand units, two hundred and forty of such regiments would have to pass before the review would end; and if three minutes were allowed for each regiment to pass, the parade would last from eight o'clock in the morning till 8 o'clock in the night.

These figures may help to understand why during the fiscal year 1922-23 some six million dollars were spent by the country in the education of its youth; but the limit has not been reached

by any means, as considerably more has to be invested by Porto Rico, in order to give good educational opportunities to each one of its 450,000 people between the ages of six and eighteen years.

Legal school age is from eight to fourteen years, covering the eight grades of elementary or common education. In the public establishments the attendance is mixed, there existing no sexual or color lines. In the first four grades all the subjects are taught in the Spanish language, although the children are taught English from the first grade; from the fifth grade on, English is the language used for the transmission of all knowledge, except Physiology and Spanish. The study of Spanish is kept up throughout the elementary, secondary and university instruction. In this manner Porto Rico will soon be a thoroughly bilingual country.

In the year mentioned there were in the Island 1,455 elementary graded schools, in the urban zones, and 2,015 rural schools. The number of common-school graduates amounted to 3,300. Spanish, English, Arithmetic, Geography, History, Drawing, Music, Writing, Home Economics, Manual Training and Physiology are the subjects covered by the elementary instruction.

The secondary or high schools were 16 in number, and there were besides 36 continuation schools, where part of the high-school subjects were taught. Four hundred and fifty students graduated in that year in the high schools of Porto Rico. Two courses are offered, the Scientific and the Commercial.

The University of Porto Rico consists of the Departments established at Río Piedras and Mayagüez. The College of Liberal Arts, Law, Pharmacy and the Normal School are located in Río Piedras, while the College of Agriculture and Mechanic Arts is conducted at Mayagüez. The University of Porto Rico grants degrees in civil, electrical and mechanical engineering, architecture, bachelor of arts, science and law, pharmaceutical chemist, graduate pharmacist and normal and rural teacher. Some 450 graduated at these colleges in 1922.

The Department of Education of Porto Rico conducts also a technical school in San Juan, a school for the blind in Ponce, and night schools and needlework, drawnwork and embroidery classes in many towns of the Island.

A Division of Extension Work and Examination is also provided for, which conducts annual examinations leading to the High School Diploma.

Under the direction of the Department of Health are the two

charity schools, one for boys and one for girls, both located in San Juan. The reformatory school, for boys and girls, in Mayagüez, and the night schools in the Penitentiary and in the seven district jails are directed by the Department of Justice.

Of the private educational institutions of Porto Rico, one of the most important is the Polytechnic Institute of San Germán, where technical and mechanical training is given to a large number of students. There are in all some 60 private elementary and secondary schools in the Island, most of which follow the official course of study. Twenty-four of these schools are accredited by the Department.

The public schools of Porto Rico, in the year indicated, were conducted in 2,205 different school buildings, of which 621 were public property. Some of these buildings are truly palatial in size and architectural beauty; the total value of the school property is over four million dollars.

There were employed in publicly supported schools of all grades 4,003 teachers, of whom 1,197 were men and 2,806 women. The supervision of these schools was in charge of some 70 inspectors and directing officials of all kinds.

COMMENT.—Where some 22,000 children went to school 25 years ago, nearly a quarter of a million now receive an education. The effort, though tremendous, is not at all sufficient, as has been already remarked: if Porto Rico is ever going to assume a leading position as a democratic community—and this must be—the number of public schools in the country must be steadily increased, and the quality of the educational plant, both in material and personnel, must be constantly raised. *“More and better schools, and more and better teachers”* should be the highest of patriotic ideals.

The kind of education which Porto Rico is giving its children could also be improved. Where there are now 16 high and 36 continuation schools, the modern trade or industrial school is unknown. Even the only establishment where the attempt has been made—the Baldorioty Technical School, in San Juan—is far from meeting the requirements.

It is possible that, for the present at least, instead of the common and high-school courses, a general course of nine years were advantageously substituted, making the acquisition of a mechanical trade compulsory during the last two years, and paying, throughout the course, much more attention to the artistic development of the pupil. That music and the graphic arts should be given more

attention than they now command in our public schools is self-evident, considering the temperamental qualities of our people.

In the normal branch, the day must come when the future educators of Porto Rico will finish their career—the last year of it at the very least—in the normal schools of the continent.

VI

THE PRESS

The printing press made its first appearance in Porto Rico in the year 1806, and some time after, in 1807, the first periodical publication—*Gaceta de Puerto Rico*—came out. By the year 1898 ten or twelve newspapers and other periodical publications were being issued, four or five dailies among them, the oldest being *El Boletín Mercantil de Puerto Rico*.

To-day some 15 dailies and about 25 other periodicals of all kinds are published in this country. Several of the dailies are large in size, set up and printed by modern machinery, and quite up to date as regards promptness in giving the more important news of the world; their cables are received from Havana or New York.

However, in view of the progress made by Porto Rico in so many directions, it may be safely asserted that its press has not yet reached that exalted position which by right belongs to *the thought in print* throughout the civilized world. Because of its splendid network of roads and means of communication, this small Island might well be considered as a single city for the purpose under discussion; not less than 400,000 possible readers are to be found within three or four hours' time from San Juan; therefore our largest daily papers should command many times as much circulation and influence in public opinion as they actually have.

Undoubtedly the press in Porto Rico is in a period of transition. Within the next ten or fifteen years great improvements must occur in this all important branch of human activity, and the Porto Rican newspaper of the near future will be what it must be: an educational force and an agent of progress second to none.

VII

PUBLIC HEALTH

Porto Rico is generally a healthful country; if we compare a happily gone past with the present, not too much praise can be

spoken in favor of the sanitary progress made by the Island during the last twenty-five years. In 1899-1900, for instance, mortality reached 42 per thousand, while in 1919-1920 the death rate was only 23.33 per thousand, and even this is considered too high for Porto Rico, where in 1913-1914 the rate of mortality was only 18.44.

Records of the years 1909 to 1920 show that the most healthful town in Porto Rico proper¹ is Naranjito (12.99), Barranquitas following (13.60). The most unhealthful is Mayagüez (33.12), next being Guayama (30.44). That the uplands are in general more healthful than the coast is shown by the fact that of the 15 towns having a mortality rate below 20, twelve were mountain cities, while of the 18 having above 25, only three—Juncos, Juana Díaz and Caguas—were interior towns.

The diseases most responsible for mortality in Porto Rico are the following:

Tuberculosis, which in 1922 caused the death of 2,667 persons. This is a disease of the lungs, caused by the bacillus of Koch, easily transmitted by contagion from those affected. There is no drug that can cure tuberculosis, but in its first stage the patient may be cured by resting, having wholesome food, and free exposure to sun and fresh air. There are no exact figures for the total number of tubercular persons in the island, but some experts have estimated them at 9,000 more or less. The distribution is generally over the territory, but more frequent in the cities than in the rural districts, in the coast towns rather than in the mountainous regions, and in the densely inhabited cities where small rooms without light and ventilation favor the development of the germs.

Malaria.—This is an endemic disease very common in the country, particularly along the low lands along the northern and southern coasts. The germ is transmitted by the bite of a certain mosquito. In 1922 deaths from malaria were 1,108.

Anemia or Uncinariasis.—Dr. Bailey K. Ashford, the discoverer of the hookworm in Porto Rico, figured that during the years 1900 to 1904 not less than 98 per cent of the *jibaros* or agricultural laborers were affected by this disease. Anemia is caused by a parasite, the hookworm, about three-fourths of one inch in length and as thick as a pin. It buries its head in the wall of the intestine and by its poison dissolves the blood of the victim. The bare-footed laborer and country people in general step on infected

¹ But in Culebra Island the mean annual rate is below 8 per 1,000.

ground, and it is through the lower extremities that most of the time the tiny killing organisms get into the human body; of course anyone is apt to contract the disease by eating or drinking infected food. For the sick persons the best remedy is an adequate dose of thymol, and the only way to prevent the disease is the proper disposition of human excrement, and the use of shoes. Uncinariasis has killed as many as 12,000 persons in one year, and is yet the scourge of the beautiful countryside in Porto Rico.

Typhoid Fever.—This disease is generally contracted by drinking impure liquids or food of any kind. One should be careful not only with what is eaten at home, but also with the candy, refreshments, etc., taken outside.

The Department of Health, as already explained, has charge of all the public activities connected with the sanitation of the Island, except those directed by the United States Public Health Service, which are attended by federal officers, and some features connected with the new Municipal Law, about which something is remarked at the end of this chapter.

The Asylum for the Insane, Asylum for the Blind, Antituberculosis Sanatoriums at Río Piedras and Ponce, Quarantine Hospital, Leper Colony, two Charity schools, one for boys and the other for girls, the school for deafmutes and a hospital for uncinariasis in Utuado, all depend on the Department of Health. Besides, the Department has charge of the extinction of uncinariasis, as well as of malaria and of mosquitoes. In the first of these activities valuable cooperation has been lent by the Rockefeller Institute. The Central Aguirre gives financial assistance in the fight against malaria and mosquitoes, in the jurisdiction of Salinas.

COMMENT.—So much must the country expect from its Health Department that no crippling measure of any kind for this important branch of the public service should be tolerated by an intelligent community. In this connection it will be well to copy *ad litteram* from the Commissioner's Report for the year 1920.¹

“A fundamental change has taken place during the past year in the organization of the Department of Health owing to the working of the new Municipal Law which gives to the municipal assemblies the nomination of the health officers in their various territories. As was to be expected, it is detrimental to the sanitary progress of the country and it may be stated that it is not progression but retrogression.

“All modern opinions agree that centralization is a necessity in sanitary

¹ The Municipal Law has since been amended, to comply in part with the spirit of the recommendation in that Report.

matters, owing to the distinctive technical status of such a governmental service, above all in countries constituted like Porto Rico—small, densely populated, with many means of communication, short distances to travel, and centers of poor population with slender resources, where it is not possible that each municipality give itself a complete modern sanitary organization, for that would be out of reach of its resources.”

VIII

LAW BREAKING—REGENERATION AND PREVENTION

In the year 1922 there were in the penal institutions of Porto Rico some 1,200 convicts, or less than 1 per thousand of the population of the Island. Of these law breakers only 34 were women and the rest were men, mostly between the ages of 21 to 25 years. Nearly 500 were negroes and mulattoes and the other 700 were white. The same proportion, more or less existed as to illiteracy among the convicts.

The convict population was distributed between the penitentiary, in the capital city, where those convicted of felony are confined, and the district jails of San Juan (2 jails), Arecibo, Aguadilla, Mayagüez, Ponce, Guayama, and Humacao. Besides those prisoners, there were about 40 convicts on parole.

Compared with penal institutions in the most progressive countries of the world, those of Porto Rico leave still much to be desired. Considerable improvement, however has been obtained in this direction during the last few years, and the result is that to-day the penal institutions of the Island tend more and more to regenerate its inmates. A systematic life of honor, study, work and recreation helps them along in such a manner that when dear liberty is obtained, the free man will easily regain his stand in society as a law-abiding citizen.

While in prison the illiterate learns how to read and write. He also learns a trade, as carpenter, shoemaker and tailor shops and a bakery are operated for his benefit in the Penitentiary. For recreation and physical exercise he has cinematographic, phonographic and athletic appliances; and those convicts that are not employed in prison are put to work on the maintenance and repair of roads. In the Arecibo jail, where all the female convicts of the country are confined, a primary school as well as a sewing and embroidery class is conducted. Convicts obtain for their labor a money compensation, of which one part is kept as a reserve fund, and the balance is sent to their needy relatives.

At Mayagüez there is a Reform School; only those under 16 years of age are admitted, and inmates are placed at liberty not later than when they are 21. As the name implies, the establishment is an educational and reform institution. In 1922 there were over 200 inmates who were given academic and industrial instruction. Of course recreation and amusement are provided; the band of music of the institution is reputed as the best boys' band in Porto Rico.

The Police.—According to law, the Insular Police of Porto Rico is charged with the responsibility of the protection of life and property, and the preservation of peace and order in Porto Rico. How high the efficiency of the organization is can be easily judged when it is considered that the total number of officers and men is only about 700, one policeman for every 2,000 inhabitants. A more efficient organization of its kind could hardly be found anywhere in the world.

IX

COLLECTIVE FORCES

Masonry.—Of the existing fraternal societies, the oldest in the Island is Freemasonry, which apparently was introduced towards the beginning of the nineteenth century. The order is very prosperous, there being more than 5,000 active masons in Porto Rico, working in some sixty symbolic lodges, of which eight are located in San Juan.

Knights of Columbus.—This is another fraternal society, made up exclusively of practical Catholics. It was introduced in the year 1911 and its prosperity is evident since it has already about 1,400 members distributed in ten councils all over the Island.

The Elks and the Oddfellows.—These are also fraternal associations; both are doing excellent moral work in Porto Rico.

The Young Men's Christian Association, introduced in 1909, has for its aim the moral, mental social and physical improvement of youth. Its activities are for the present restricted to the capital city where in its splendid building the members find all kinds of honest recreation for body, brain and spirit.

The Athenaeum of Porto Rico (Ateneo Puertorriqueño) came to life in 1876, and it has been the highest beacon of genuine regional culture ever since. The record of this institution as a diffusive agent of scientific and artistic thought has been a brilliant one, and it is hoped that in its splendid new home, one of the most

beautiful structures in San Juan, still greater activity will be shown by the learned association. Among its four hundred members are found nearly all the men of letters of Porto Rico.

Porto Rico Teachers' Association.—To use the words of the president of this institution, its aim is "to dignify the teacher and protect the child". Besides its professional aspect the benevolent feature of the society affects in the way of pension or insurance its 3,000 or more members.

The Free Federation of Workers of Porto Rico, now incorporated with the **Free American Federation of Labor**, and the **Porto Rican Federation**, are two institutions whose indential purpose is to relieve the condition of the Porto Rican workingmen, both from the economic and the moral view point. The organizations count their members by the thousands.

The Red Cross.—The Porto Rico Chapter of the American Red Cross was organized in the year 1917, and its activities immediately started as a War Relief organization. After the War, a systematic social-welfare and relief work in general were planned and carried out, and whenever a calamity struck the Island the American Red Cross did its humane duty splendidly. The General Headquarters are located at San Juan, there being branches in all the important towns in the country. Hundreds of thousands of dollars are yearly raised in the Island by this philanthropic organization.

The Red Cross has an off-shoot, the **Juvenile Red Cross**, whose activities are connected with the public-school system. Both, chapter and branch, are intensively active in their benevolent work.

The Chamber of Commerce of Porto Rico, the **Retail Dealers' Association**, the **Association of Sugar Producers of Porto Rico**, the **Association of Tobacco Growers**, and the **Coffee Producers' Association** are institutions which, in accordance with their titles, have for their aim the fostering of the respective interests of the commercial, industrial and agricultural elements.

Besides those associations, there are numerous professional societies, such as the **Bar Association**, the **Society of Medicine**, the **Dental**, **Engineering**, **Pharmaceutical**, **Journalistic** and the **Authors' and Artists' Associations**, all non-lucrative institutions working for their respective and common good. The **Suffragist** or **Feminine League**, whose purpose is the vindication of women's rights; and the political parties, **Unionist**, **Republican** and **Socialist**, strong organizations which contribute in a great way to keep the country alert to the responsibility of a self-governing people.

The Spanish Colony, about 5,000 strong, conducts several institutions, such as the **Casa de España**, the **Auxilio Mutuo y Beneficencia** and the **Spanish Clubs** in San Juan and other towns. All of these are first-class institutions.

Finally, in every town of some importance of Porto Rico there are one or more clubs or "casinos" where the social and recreative life of the communities finds expression.

In all, there are in the country some 200 leagues, societies, corporations or organized groups of persons, of non-pecuniary character and whose aim is coöperation work for the social good

FOURTH PART

THE ECONOMIC DEVELOPMENT

I

GENERAL STATISTICS

The total wealth of the country has been officially put at something like \$300,000,000. Of this sum, about \$270,000,000 are real and personal private property, and the balance represents the total investment in public works, one-third of which is municipal unexpendable property and two-thirds insular property. Of the real property—over \$200,000,000—the following big items may be pointed out:

City and town building lots.....	\$17,000,000
Improvements	37,000,000
Track and railroad structures.....	6,000,000
Electric plants	2,500,000
Telephones.....	1,250,000
Sugar cane.....	41,000,000
Sugar machinery and buildings	23,000,000
Coffee	15,000,000
Tobacco	2,000,000
Oranges.....	1,250,000
Cocoanuts.....	2,000,000
Minor fruits	4,000,000
Pasture.....	38,000,000
Timber brush.....	5,500,000

The personal property—some \$54,000,000—may be roughly divided as follows:

Money.....	\$3,700,000
Merchandise, raw materials, etc.....	24,000,000
Cattle, horses and other animals.....	7,200,000
Automobiles.....	2,130,000
Other vehicles	400,000
Portable track.....	475,000
Machinery	1,620,000
Rolling stock.....	3,500,000
Vessels.....	550,000
Other property	10,700,000

The total insular revenues for the year 1920-1921 was conservatively estimated at a little over \$9,000,000, the main sources being

Custom-House Receipts, U. S. Internal Revenues, and Property, Income and Excise Taxes. As to public expenses, the largest budget passed by the Legislature of Porto Rico has been that of the year 1922-1923, amounting to some \$12,000,000 with the following largest items:

Education-----	\$4, 600, 000
Public works -----	1, 850, 000
Public sanitation -----	1, 250, 000
Police-----	865, 000
Department of Justice -----	1, 100, 000
Agriculture and Labor-----	500, 000

The total indebtedness in 1922 was very close to \$12,000,000, represented by bonds of different issues; but as the legal limit under the Organic Law would be more than twice that figure, basing the estimation on the present assessed valuation of the country, the credit of Porto Rico in the American financial market is very high, and all the bonds issued are readily disposed of at from 10 to 15 per cent over their par value.

The country has contracted those obligations for the purpose of carrying on large public undertakings such as the construction of roads, school buildings, irrigation works, the dredging and general improvement of the island ports, etc.

COMMENT.—The development of public administration in Porto Rico, from its different points of view, has been remarkable. Scarcely one hundred and forty years ago the total public revenue did not reach ten thousand dollars, and in order to pay for the expenses of running the government a large consignment of money—*situado*—came yearly from Mexico; but when at the beginning of the last century that country became independent, Porto Rico was thrown on its own resources and had to raise by itself the needed revenue. A great man, Don Alejandro Ramírez, was called upon to do the work, and the development of public finances was soon well under way. By 1898, when the change of sovereignty took place, the Island wealth had increased, in spite of tremendous political and economical obstacles, to about \$30,000,000 the total public budget reaching one-tenth that figure. Since then the growth has been continuous and, of course, will have to increase in order that the country may pay the proper attention to the demands made by progress, as it must be in a civilized community.

II

LAND AND AGRICULTURE

According to official information¹ the cultivated and uncultivated land in Porto Rico, in the year 1919, was distributed as follows:

Sugar cane -----	238,901 acres
Coffee -----	158,913 acres
Tobacco -----	22,912 acres
Pineapples -----	2,879 acres
Oranges -----	6,122 acres
Cocoanuts -----	9,152 acres
Minor fruits -----	102,435 acres
Pasture -----	1,014,741 acres
Timber and brush -----	445,932 acres
Marshlands -----	18,952 acres
Other lands -----	51,129 acres
Total -----	2,072,068 acres

It should be noted that the lands devoted to cane, coffee, tobacco, pineapples, oranges and cocoanuts are, in general, the best of the country for agricultural purposes, and according to commercial statistics, are valued at nearly eighty million dollars. Furthermore, the acres classified as "pastures" are not really devoted to grazing, as it might be inferred at first sight. The term is employed in order to comprise the natural grass lands, a large part of which is not made use of.

The last federal census brings the following distribution of the land into estates of various sizes:

	1920	1910
Number of estates with less than 10 acres -	15,981	31,959
Number of estates with 10 to 19 acres -----	9,621	10,045
Number of estates with 20 to 49 acres -----	8,467	8,872
Number of estates with 50 to 99 acres -----	3,493	3,728
Number of estates with 100 to 499 acres ---	3,047	3,228
Number of estates with 500 to 999 acres ---	302	322
Number of estates with 1,000 acres and more	167	207
Total number of agricultural estates --	41,078	58,371

Thus, in ten years, the number of land estates in Porto Rico has dwindled by over seventeen thousand; the number of the smallest parcels—of less than 10 acres—has been reduced to less than

¹ Report of the Governor of Porto Rico to the Secretary of War, year 1920.

one-half of those existing in the previous decade, while the large estates are becoming larger in extent and fewer in number.

Time and again it has been asserted that Porto Rico is an agricultural country. Indeed, there being practically no mines nor factory industries in the territory, it is a fact that its inhabitants must depend more or less directly on agriculture. But the real fact is that Porto Rico exports the bulk of its agricultural production, and imports almost everything needed in foodstuffs, not to mention manufactured articles of every description.

"Under the prevailing commercial system," to quote the official report, "the only purpose of production is not to satisfy the needs of the inhabitants but the needs of commerce itself; to make money and to purchase therewith all that is necessary for life.

"Thus commerce is benefited in two ways: (1) by the profits it makes on exports, and (2) by those it makes on imports. On the other hand, the working class, the small farmers and the agriculturists, who have no participation in the big commercial and industrial enterprises, have to pay for the profits made by the merchants, this really meaning contribution without consent a fact contrary to the principles of true democracy."

III

SUGAR CANE

This plant, which furnishes the main source of wealth of Porto Rico, was introduced by Columbus himself into Hispaniola, (Santo Domingo) and a few years after was brought over to Porto Rico. According to historical records, the first sugar mill was established near Añasco, in the year 1523.

There are six kinds of soils in Porto Rico, suitable for the raising of sugar cane, as follows¹:

The Maritime Soils.—These include what, until comparative recent years, were the bottom of the shallow salt water bays and lagoons. Later these became mangrove swamps and salt marshes and now, by the continual accumulation of *débris* of all kinds, principally rotted vegetation, they have become high enough to permit cultivation. The lower, more marshy parts, are locally known as "*poyales*", and the somewhat higher levels are known as "*semi-poyales*" and uplands.

¹See Mr. Franklin Sumner Earle's article in "The Book of Porto Rico," edited by Dr. E. Fernández García.

The Alluvial Soils.—These have been built up along streams by deposits of silt, sand and gravel, and along the southern coast especially they have spread out to form an extensive, nearly level flood plain, which constitutes the most valuable sugar-cane area on the Island.

The Red Coral-limestone Soils.—These are found in an area of considerable width, occupying the lower levels among the sharp limestone hills along the northern coast, from the Tea River west to Rincón.

The Calcareous Soils with a White Subsoil.—There are only comparatively small areas of this type of soil in Porto Rico, mostly in the southwestern districts.

The Red Shale Clays.—These constitute a very extensive soil area extending over the foothills and the northern flank of the main central range all the way from Fajardo to Mayagüez.

The Black Hill Lands.—At various places in the foothills, particularly in the eastern districts, there are limited areas of a rich black soil derived from some of the older igneous rocks.

Besides in these six main types, cane is occasionally planted in a great variety of other soils, and but for the difficulties of transportation, it could be grown successfully on most of the heavy coffee soils of the interior.

The principal varieties of sugar cane grown are the following:

The original type introduced, which came to be known as **Creole**.—This is a slender, feeble-growing kind from India, that came to Spain during the Crusades, and thence to America, as already stated. It long since passed out of general cultivation, and is now almost extinct, only an occasional stool being found planted in door yards because it is so soft that it is a favorite for chewing.

The **Otaheiti** or *caña blanca*, introduced into the West Indies towards the end of the XVII century.—This large, handsome green cane, yellow at full maturity, quickly supplanted the Creole type, since it yielded from a third to a half more sugar per acre.

The **Cheribon Canes** came mixed with the early importations of Otaheiti, and their name is derived from that one of the district in the Island of Java where it had long been grown. The Louisiana Purple or *caña morada* the Louisiana Ribbon or *caña rayada* and "Cristalina" or White transparent, are simply three color variants of the Cheribon type of cane. These canes attracted no attention in Porto Rico until about 1873 when an epidemic appeared in the Mayagüez district which attacked the Otaheiti cane and forced the

abandonment of its cultivation throughout the western portion of the Island. It was soon observed that the scattered stools of the Cheribon cane were not attacked by the disease, and they began to be selected out and planted in the diseased districts. For some unknown reason the purple form (*morada*) never attracted much attention in Porto Rico but the striped form (*rayada*) and the Cristalina soon became the standard varieties for the Island, the former being more planted on the northern coast and the latter on the southern coast. To this day these canes are probably producing three-fourths of the sugar of the Island.

The Cavangerie.—The epidemic of 1873 caused the importation of twenty or more kinds of sugar cane, mostly from the French West Indies. A number of these are still to be found in the Island, but only the Red Cane, or French Cane, properly known as Cavangerie, has come to be widely planted. This is a handsome claret-red cane with a bronze stripe. Color forms without the stripe also occur.

Yellow Caledonia.—This variety was imported from Hawaii and is now extensively cultivated here, especially in the exhausted soils where the Cheribon canes begin to fail from root disease.

The Uba and other Canes.—The Uba, for many years the only kind of sugar cane planted in Natal and other parts of South Africa, has been recently introduced from the Argentine. On account of its thriving in many kinds of soils where the other varieties cannot be profitably planted, and because of its immunity to the mosaic and other cane diseases, the Uba apparently will have a great future in Porto Rico. During the past twenty years a considerable number of seedling canes produced in Barbados and Demerara have been grown locally by the experimental stations and by some of the Centrals. Some of these are very promising.

Sugar-Cane Diseases.—Among the many kinds of diseases affecting sugar cane in Porto Rico, the only ones deserving attention here, because of their destructiveness, are the **mosaic**, **gum-ring** and the **dry top rot** diseases. The mosaic or *matizado* disease, shows itself first in the leaves, whose surface, instead of being of uniform green color show the characteristic mottling. The effects on the cane stalks begin by a contraction of the internodes, and later the stalk is stunted and cranked in various places. The cause of this disease is yet unknown.

The *gumming* disease is best recognized at the time of the harvest by the yellow gummy exudation which oozes out in small drops from the fibers in the cut ends of infected canes. The disease is caused by a microbe and its economical effects are reduction in tonnage and difficulty in elaboration at the mill.

The *dry top rot* disease is the cause of heavy reduction in tonnage, ratoon failure in some of the best lands; it attacks most of the best-known varieties, working in the canes in an obscure and unnoticeable manner until they are mature, when the leaves turn yellowish green and begin to dry up from the interior of the top outward. The disease is caused by a microbe.

SUGAR MILLS AND SUGAR PRODUCTION

In the year 1922 there were grinding in Porto Rico 47 sugar mills of all sizes, several of them being among the largest in the world. The total quantity of cane ground reached more than 3,650,000,000 tons and the total yielding was over 400,000 tons of sugar.

One year approximately after planting, sugar cane is ready for grinding in Porto Rico. The cane is then cut and transported to the mill, where the manufacturing process takes place. Grinding by metallic rolls and boiling the juice until cristalization point is obtained is accomplished in the course of several hours, and then the article is put in bags, ready for the market.

Sugar, as a product, is by far the most important economic factor in Porto Rico for the present. About 240,000 acres of the best land in the territory are under sugar-cane cultivation, and the number of people actually employed in the planting, manufacturing and traffic of sugar is about 85,000, of which some 80,000 are field laborers of both sexes 10 years or more in age. The total value of sugar, molasses and syrup shipped from Porto Rico to the United States proper, during the fiscal year 1919-1920, was more than \$98,000,000.

IV

TOBACCO

Next to sugar, tobacco is the most important product of the territory. The plant, as a commercial product, began to be cultivated since the early colonial times, and the quality of the Porto Rican leaf seems to have been held in great esteem at all times.

Tobacco is generally raised in alluvial soils and on the river

banks, when along the coast or in lowlands of the Island; in clay soils in the more inland districts, and in calcareous soils with a thin layer of vegetable earth, in the mountains. Soils and climatic conditions are described as ideal, particularly in the central portions of Comerío, Caguas and Cayey, but experts are of opinion that much better results could be obtained if the rotation of crops and the use of fertilizers were more strictly observed.

In Porto Rico the preparation of the soil for the seedbeds of tobacco is started on May or June, and Saint Rosa's day (August 30) has been from time immemorial set aside for scattering the first seeds. About two months after the herbs are ready for transplanting, and some three months after transplantation maturity is reached. The plants are either cut entirely out, or only the fully ripened leaves are picked out. The leaves are then placed in special sheds to sweat, and a few days afterwards grading or classification starts. Finally, packing either in bales or barrels is done and the product is ready for the market.

Formerly the plant was raised exclusively in the open air, and for the best grades, a dark-colored wrapper of little appreciation in the American market being the result. Cultivation for these grades of wrappers is now carried on under cover. The cost of the instalation of posts, wire, cloth, etc., is high, but the price obtained for the leaf largely compensates the expense.

To-day some 40,000 acres of land are given over to tobacco culture in the Island, and the number of people employed in tobacco raising is about 23,000. In the year 1922 about 22,000,000 pounds of tobacco leaf were shipped by Porto Rico to the United States proper, the total value of the shipments being some \$9,000,000.

THE TOBACCO INDUSTRY

Cigar and cigarette factories on a large scale such as those of to-day, were unknown in the Island before the American occupation. Many large, modern buildings are now devoted exclusively to the manufacture of cigars and cigarettes, the former being all hand-made, and the cigarettes turned out by the most up-to-date machinery. In the year 1921 more than 600,000,000 cigarettes and more than 250,000,000 cigars were made in the country, the total value of this production being about \$12,500,000 and the number of people employed in the industry about 9,000, mostly women.

V

COFFEE

Coffee was introduced in Porto Rico towards the middle part of the eighteenth century, under the rule of Governor Ramírez de Estenós, who encouraged greatly the cultivation of the tree. It is a bush which does not yield in this country before the fifth year, and requires shading as a protection from the direct rays of the sun. The higher in the mountains the plantation is located the less the shade needed. The guava and guama trees and the banana plant are usually employed in Porto Rico for coffee shading.

The best soil for growing coffee is one of heavy texture containing a high percentage of clay. The clay soils being generally less subject to the washing action than sandy soils, they retain humidity better and last longer.

Nearly all the coffee estates in Porto Rico are located in the interior, mountainous districts, the total acreage devoted to this industry being about 200,000. The harvest or picking of the berries from the trees—which is done by the hand of men, women and children—usually starts in July or August, and continues until February. The berries are then dried, either by exposure to the sun, or by machinery, and all the other operations connected with their manipulation are then performed until the grain is ready for the market.

According to the census, about 45,000 people were directly employed in the coffee estates and establishments during the year 1920. The total production reached 53,000,000 pounds and the value of the crop was nearly \$15,000,000.

Porto Rican coffee is classified commercially as mild, and is comparable in this respect to coffee grown in other parts of the world, outside of Brazil. In Cuba, as well as in Spain and other European countries, Porto Rico coffee has long been a favorite, the price paid for it being a very high one. In the American market, however, there are many grades of coffee, particularly those of Colombia and Guatemala, commanding better prices than the best Porto Rican grain; but there is no doubt that with a proper and more intelligent manipulation of the article, from a commercial standpoint, a better appreciation could be obtained in the United States. From the point of production, too, considerable improvement could be made. Colombia and Central America can show Porto Rico many good things toward the increase of production through better methods of cultivation, etc.

VI

COCOANUTS, ORANGES, PINEAPPLES, MINOR FRUITS

Bananas in their many varieties, corn, beans, sweet potatoes, yams, *yautías*, etc., are styled *minor fruits* in Porto Rico. To their cultivation about 100,000 acres of land are devoted, the distribution being fairly even all over the Island. The total value of this production is put at some \$5,000,000.

The cocoanut palm, ought to be the most useful of all tropical trees. In Porto Rico it grows along the coast, being the characteristic element in the landscape. Some 10,000 acres are given over to the culture of this palm, and over \$1,000,000 worth of the ripe (dry nut) fruit were exported to the United States in 1920.

Porto Rican citrus fruits have a very good reputation in the continent, particularly the oranges and the grape-fruits. Lately new types have been introduced and are being raised in substantial quantities, the navel (*ombligo*) orange occupying a foremost position. Six thousand or more acres are devoted to the raising of citrus fruit, and the value of the exports in the year mentioned amounted to about \$2,000,000.

Pineapples rank third in importance among the fruits raised in Porto Rico. Three thousand acres of land, along the coastal plain, go to pineapple culture, the production amounting in value to between \$500,000 and \$1,000,000.

VII

FOREST AND TIMBER AND BRUSH LANDS

All historical records point to the previous existence of thick woods all over this tropical Island. "The forests which cover the mountains of Porto Rico," says an early writer, "are filled with timber of the best quality for the construction of ships and houses." But since the beginning of the last century deforestation began in a very unjudicious manner, and the practice has increased with the growth of population. Besides the Luquillo National Forest, in the Luquillo Range, containing about 15,000 acres (*cuerdas*), several tracts have been declared Insular Forest Reservations. Fifteen thousand acres of these are of mangrove swamp, situated about the bays and mouths of rivers in some 20 different municipalities, and 25,000 more acres are in Maricao, Sabana Grande, San Germán, Guánica, Yauco, and in Mona and Monito Islands.

VIII

PASTURE LANDS—CATTLE RAISING—OTHER DOMESTIC ANIMALS

In former years cattle raising was one of the chief agricultural industries of the country; not as far back as twenty years ago, great quantities of animals on the hoof were shipped to Cuba, but with the advent of sugar-cane planting on a large scale, that industry has steadily declined. The horses of the eastern coast, particularly those of a certain Yabucoa ranch, were held in great repute and commanded big prices here and in the neighboring country. The coming of the automobile seems to have taken the incentive off the horse-breeding industry.

To-day a little more than 1,000,000 acres of land are classified as "pasture". Domestic and other animals in the country are enumerated as follows:

Horses-----	57,000
Mules, donkeys-----	8,000
Milch cows-----	55,000
Other cattle-----	220,000
Pigs-----	137,000
Goats-----	58,000
Sheep-----	4,000
Chickens-----	1,300,000
Bee hives-----	41,000

IX

AGRICULTURE AND LABOR

The Department of Agriculture and Labor has been created "to foster and develop the agricultural interests and the welfare of the wage earners of Porto Rico, to improve their working conditions and to advance their opportunities for profitable employment."

Accordingly, two bureaus (*negociados*) conduct the main activities of the department: the bureau of Agriculture and that of Labor.

Under the former a constant propaganda is kept up to teach the farmers how to improve and increase production, instilling in them sentiments of cooperation by practical means; to that end, agricultural experimental stations are conducted in Río Piedras and Mayagüez, with a demonstration plant at the latter city, and another demonstration plant, for the fishing industry, at Playa de Humacao. Numerous representatives of the department conduct

useful work of various kinds connected with the educational propaganda in the country, near the farmers, organize them into leagues, both for professional and financial purposes, etc.

The Bureau of Labor looks after the welfare of the wage earners from all points of view; it sees that all laws, ordinances, rules and regulations dictated for the protection and benefit of the wage earner are duly enforced and complied with. The field of activity of this bureau is very wide, ranging from the delivering of periodical lectures on such topics as "How Labor and Capital can Cooperate for the Progress of the Community," to looking after the enforcement of the law that regulates the erection of scaffolds for building construction, etc.

The country has been active in the social movement, listening with sympathy to the claims put forward by the laborers, in their propaganda for social justice. Indeed, Porto Rico can show quite a number of model institutions exclusively designed to ameliorate the condition of the proletariat, such as the Workmen's Relief Commission, Workmen's Wards (*barrios obreros*) in the principal cities, etc.

X

OTHER INDUSTRIES

Besides those industries to which reference has been made in the chapters relative to Sugar, Tobacco and Coffee, the following are among the most important industries of the country:

Clothing, Drawn and Embroidery Work, Etc.—This is one of the most important among the industrial activities of the country. Many thousands of workers of both sexes are kept busy in home and factory, producing Men's and Women's Wearing Apparel, Lace and Drawn Work, Handkerchiefs, etc. There are more than one hundred regular establishments employing over two thousand hands, in all. Many more thousands are employed at home by the industry. Of the total production, more than seven million dollars' worth were exported to the United States proper during the year ending in June 1924.

Alcohol, Bay Rum and other distilleries; **Clothing, Hat** and **Shoe** factories; **Bread** and other **Bakery** works; **Brick** and **Tile** yards; **Carriage** and **Wagon** works; **Food** preparations of various kinds; **Foundry** and **Machine** shops; **Ice, Chocolate** and **Soup-Paste** factories; **Lime, Marble** and **Stone** works; **Furniture, Mat-**

tresses and **Bed-Spring** factories; **Pearls** and **Pearl-Button** Works; **Mineral** and **Soda-Water** plants; **Diamond-Cutting**, **Printing** and **Publishing**, **Book** and **Job-Printing**; **Trunk** and **Valises**, and several other manufacturies.

COMMENT.—There is absolutely no reason why Porto Rico should not develop the many industries it needs in order to support a fast-growing population. All kinds of industries, it is true, cannot be profitably established in the Island for the present, but many things could and should be made, after the proper and mature consideration is given to the subject. Careful study of the particular article to be produced is essential, from the purely industrial as well as from the commercial point of view. It would be easy to show how the country is sending money out every year, to pay for goods that could perfectly well be made here, since in every case excellent raw material is found or can be produced in Porto Rico.

XI

MERCANTILE LIFE

During the fiscal year ending in June 1920, the combined import and export trade of Porto Rico amounted nearly to \$250,000,000. The balance of trade, which since 1907 has been in favor of the Island, reached in the mentioned year more than \$54,000,000. Business is carried on, with some 40 different countries, although about nine-tenths of the total trade is with the United States. The total tonnage reached almost 4,000,000. The following is obtained by examining commercial data for the mentioned year:

Exports.—The main countries where the shipments of the Island went, and the approximate value of the stuffs shipped were:

United States -----	\$133, 000, 000
Dominican Republic -----	7, 400, 000
Cuba -----	7, 300, 000
Spain -----	1, 600, 000
Virgin Islands -----	336, 000
France -----	312, 000
United Kingdom -----	258, 000

Italy, Mexico, the Netherlands, Sweden, Norway, Canada, Panama, Argentine, Brazil, Chile, Uruguay, Colombia, Venezuela, and several other countries received also their share of goods from Porto Rico.

Products exported and their respective value were as follows:

	United States	Foreign
Sugar and molasses-----	\$100,000,000	\$250,000
Tobacco:		
Leaf-----	12,500,000	100,000
Manufactured-----	12,000,000	15,000
Cocoanuts-----	1,130,000	12,000
Other fruits:		
Green, ripe or dried-----	2,600,000	4,000
Canned and preserved-----	115,000	9,000
Cotton (Sea Island)-----	190,000	-----
Beeswax and honey-----	450,000	10,000
Straw hats-----	115,000	55,000
Coffee-----	250,000	8,800,000
Hides and skins-----	330,000	-----
All other exports-----	2,600,000	8,000,000

It can be seen that, exception made of coffee, the Continental markets absorbed by far the greatest part of the exports of the Island, in every case. It should be noted also that the last item—"All other Exports"—includes chiefly shipments of merchandise not of Porto Rican manufacture, exported to the Dominican Republic.

Imports.—During the year mentioned imports were as follows:

	United States	Foreign
Rice-----	\$14,000,000	-----
Wheat flour-----	5,000,000	-----
Corn meal, oats-----	700,000	-----
Fish—dried and canned-----	2,000,000	1,500,000
Meat products—hams, bacon, lard--	6,800,000	68,000
Dairy products-----	1,500,000	170,000
Bread and biscuits-----	1,040,000	30,000
Cotton manufactures-----	18,000,000	115,000
Iron and steel manufactures--	5,200,000	30,000
Leather and manufactures of-----	3,800,000	80,000
Oils:		
Mineral-----	2,200,000	350,000
Vegetable-----	320,000	135,000
Paper, manufactures of-----	1,600,000	60,000
Cars, carriages and parts-----	2,400,000	-----
Soap-----	1,200,000	10,000
Coal-----	600,000	2,000
Glass and glassware-----	200,000	3,500
Cordage, jute bags, etc.-----	1,000,000	500,000
Fertilizers-----	3,100,000	500,000
Chemicals, drugs, medicines-----	1,600,000	150,000
Paints and varnishes-----	500,000	1,300

	United States	Foreign
India-rubber goods-----	1,300,000	-----
Silks, manufactures of-----	800,000	3,000
Tobacco:		
Manufactures of-----	400,000	-----
Unmanufactured-----	1,500,000	12,000
Toys-----	150,000	-----
Wood and manufactures of:		
Boards, planks, etc.-----	1,600,000	87,000
Furniture-----	376,000	4,000
All other-----	930,000	30,000
Vegetables (beans and peas, onions, potatoes, etc.)-----	2,400,000	350,000
Wool, manufactures of-----	715,000	10,000
All other articles-----	3,775,000	1,050,000

The shipping, which during the mentioned year 1920 amounted to over 4,000,000 tons, is carried on through the ports of San Juan, (the main port of entry in the Island), Ponce, Mayagüez, Arecibo, Aguadilla, Humacao, Fajardo, Arroyo, Guánica and Vieques.

Banks, Corporations, Etc.—In 1920 there existed in Porto Rico 17 banks with an aggregate capital stock reaching almost \$4,000,000, while their total surplus and undivided profits amounted to \$1,722,000 more. Total deposits in these banks reached over \$47,000,000; aggregate loans more than \$38,000,000, and cash reserves \$12,500,000.

Five **Life Insurance** companies doing business in the country had over \$9,000,000 of standing policies, collecting for premiums over \$400,000.

Some 25 different institutions were engaged in the marine, fire, hurricane and casualties others than life. The value of the total number of policies written by these companies was more than \$76,000,000; premiums collected, over \$950,000; payment for losses, more than \$600,000.

In the mentioned year there were in legal existence and doing business in the Island of Porto Rico some 300 domestic corporations, while more than 150 foreign ones were registered in the official books of the Executive Secretary, as doing business in the Island.

COMMENT.—Money figures alone naturally do not tell all that there is about statistics. Measured by money values, the record year of production and consumption in Porto Rico was 1920, when as shown, the one quarter billion figure was almost reached; but the bulk of merchandise handled in any two different years may be approximately the same, while the cost in dollars and cents may be considerably higher in one of the two cases, and therefore mere

money values would be deceiving. The balance of trade in favor of the Island was \$54,000,000, it is true, but of this excess of production over consumption a considerable part did not remain in Porto Rico to be re-invested for the further development of the country, but went to the Continent or to foreign countries as part of the profit of absentee capital. This, absenteeism in such large scale, is one of the great problems to be solved in the future.

XII

ROADS

Of all American countries, both North and South, the Island of Porto Rico is famous for its many and splendid roads. Every one of the 74 cities and towns in the Island proper is within easy reach from any other.

There are actually in use over 1,300 kilometers of first-class state roads, with 175 iron or concrete bridges. Thirty more kilometers are now under construction, the plans of the Insular Government being to cover the Island with a network of more than 2,000 kilometers of state roads. With the proceeds of a loan of \$2,000,000 recently authorized by the Legislature, work on 200 kilometers of road will be soon started. In addition to the high-class roads mentioned, there are some 7,000 kilometers of municipal roads in Porto Rico. These roads are being constantly improved and in time it is expected that the greater part of them will become standard in quality.

By looking at the map it will be seen that the general plan of state road construction, when completed, will comprise the following:

(a) The road of circumvalation which, as implied by its name goes around the Island, by the coast. The total length of this road is 456 kilometers.

(b) A central longitudinal road which will go across the Island east to west, through the very center, from Humacao to Mayagüez. About one half of this road is now completed.

(c) The old military road, first of state roads to be constructed in Porto Rico. Total length, 134 kilometers from San Juan to Playa de Ponce. Between Caguas and Cayey a branch off the western side of this road leads to the town of Cidra; and another branch road, starting between Cayey and Aibonito, from the west side also, leads to the town of Barranquitas.

(d) The easternmost of the central roads north to south, from Loíza in the north to Patillas in the South.

(e) The branch road from Cayey in the center to Guayama in the south. The 26 kilometers of this road constitute the nicest piece of engineering of its kind in Porto Rico. This road, as well as the old military road, is part of the system constructed by the Spanish government.

(f) A central road, north to south, starting at Santurce (San Juan) and connecting with the Military Road at a point near Aibonito. The towns of Bayamón, Comerío and Barranquitas are reached by this road. Between Bayamón and Comerío this road branches off the west side leading to the town of Naranjito.

(g) A central road between Toa Alta and Coamo, passing through Corozal and Barros.

(h) A central road, also north to south, and connecting the towns of Manatí, Ciales, Villalba and Juana Díaz.

(i) A central road joining Arecibo in the north with Ponce in the south, passing through Utuado and Adjuntas. Near the latter town, at *Alto de la Bandera*, a branch runs northeast to Jayuya, in the center of the Island. Part of the 82 kilometers of its total length was constructed by the Spanish Government.

(j) A central road going from Arecibo to Guánica, in the south, and passing through Lares and Yauco. In many respects this is the most remarkable road in the Island; the distance between Lares and Yauco, fifty odd kilometers is traversed without meeting any town or hamlet, something very unusual in Porto Rico.

(k) The westernmost central road in the Island, going from Quebradillas in the north to Parguera in the south. San Sebastián, Las Marías, Maricao, San Germán and Lajas are reached by this road.

COMMENT.—Roads have been since the earliest times one of the chief among civilizing agencies, but in a small mountainous island like Porto Rico, good and rapid means of communication constitute an urgent necessity. The plan of road construction in Porto Rico might be subject to some criticism, but in spite of that it is safe to say that in no better way could the ten million dollars of the people's money had been invested, than in state roads; in no better way can several millions more be spent. When every farm can be reached directly by a first-class state road, a long step towards the ideal in rural civilization will have been realized.

To-day more than 10,000 automobiles, coaches and other pas-

senger vehicles are sufficient proof that the roads of the Island are made good use of by the traveling public every day.

XIII

RAILROADS

In the year 1887 a royal decree of the Crown of Spain authorized a French company to construct and operate a railroad line along the littoral of the Island; connection was to be established between San Juan, Arceibo, Aguadilla, Mayagüez, San Germán, Ponce, Guayama, Humacao, Fajardo, Río Piedras, and of course all the intervening towns. A branch line was to be laid also from Caguas to the port of Naguabo by way of Juncos. By 1898 some 230 miles of this line were in operation, not in a continuous line, but in several sections along the coast.

To-day it is possible to travel by railroad, along the coast, from San Juan to Guayama, a distance of 338 kilometers, and besides there are in operation two small branch lines, one between San Germán and Sabana Grande, and the other between San Juan and Carolina. The line is owned by the American Railroad Company of Porto Rico.

There is a short line (7 kilometers) running between Bayamón and Cataño, and besides 1,000 miles of private steam railroads, especially constructed for the transportation of sugar cane in the centrals.

Of electric railways, there are urban lines in San Juan, Ponce, and Mayagüez. The San Juan system, owned by the Porto Rico Railway, Light and Power Company, runs a line to Caguas, but electrification has been established only to Río Piedras, the service between this city and Caguas being done by steam. In Ponce and Mayagüez electric lines connect the cities with their respective ports.

COMMENT. — Apparently only strategical considerations dictated the construction of the first railway line along the littoral, particularly at a time when the large sugar-cane plantations along the coastal plains did not exist in Porto Rico. The universal rule seems to be to push railway lines from the coast to the interior in order to bring the heart of the country in touch with the outer world, and by means of feeding tributary roads transport persons, merchandise and ideas from the coast to the interior and *vice-versa*. As far as Porto Rico is concerned, a central line from Humacao to Mayagüez with branches at Caguas and Utuado, to San Juan

and Guayama, and Arecibo and Ponce respectively, would have given the country an excellent railway system. The cost of construction per mile, indeed would have been greater than constructing along the coast, but the life of the enterprise would have been much safer than under the present circumstances, when the maritime competition must always render precarious the existence of any railroad line running parallel to the coast.

XIV

TELEGRAPHS, TELEPHONES, SUBMARINE CABLES, RADIO SERVICE

The first telegraphic line in the Island was established in 1858, by Samuel Morse himself. It was a short private line connecting the town of Arroyo with the country house of Mr. Lind, who was a family relative of the inventor. Submarine cable connection with the outside world, by way of the neighboring island of St. Thomas was established in 1870 by an English concern. The telephone was established in the city of San Juan, in 1897.

When Spanish sovereignty ceased, in 1898, there were in operation in this Island 1,240 kilometers of public telegraph and telephone lines, with 41 telegraphic offices. Besides there were 53 kilometers of private lines. To-day there are 2,500 kilometers publicly owned and operated, and 1,000 kilometers of private lines. The rates for the telegraphic messages are cheap and the service is very good, but the private telephone service must be greatly improved. All towns, villages and country places of any importance in Porto Rico can be reached by telegraph or telephone. Nearly 500,000 telegraphic messages are transmitted by the public lines every year.

Communication with the outside world, by cable and wireless is constantly kept up. Several cable lines run from San Juan, Mayagüez, and Ponce to St. Thomas, Santo Domingo, Cuba, Jamaica and the United States. The Federal Government has powerful wireless stations in San Juan and Cayey. Private enterprises, all over the Island, keep Porto Rico in touch by radio with the rest of the civilized globe.

XV

IRRIGATION WORKS

The long-protracted droughts affecting some regions of the Island, particularly along the southern slope, made the construction of dams and other irrigation works an urgent necessity for agri-

culture. Since many years ago, and during the old days of Spain, several projects were in study, but the scheme never went beyond the theoretical stage. It remained for the Legislature of Porto Rico to approve laws providing for the long-felt need and the result is that up to the present time, important works of this nature have been effected and are in actual operation. Approximately 23,000 *cuerdas* (a *cuerda* is nearly an acre) are now irrigated along the southern coast from Patillas to the Jacaguas River, a distance of 60 kilometers, and additional works are about to be constructed, for the irrigation of 42,000 more acres of land.

The works so far constructed and in operation are the following:

Patillas Dam and Canal.—This dam is a stone and earth structure whose purpose is to store water from the Patillas and Matón Rivers. The dam is situated about one mile to the northwest of the town of Patillas; its maximum height is 132 feet by about 1,000 feet long at the base, and its maximum storage capacity is over 14,500 acre feet¹ of water. The Patillas Canal starts at this dam and ends at a point near the town of Salinas. Lateral canals located at convenient places convey the water from the main canal to the lands irrigated in an extent of almost 13,000 acres.

Carite Dam, Tunnel and Canals.—Located in the mountains, on the northern side of the main divide, about 6 miles to the north of the city of Guayama, the Carite dam impounds the waters of the Plata River, forming a pond with a storage capacity of over 9,300 acre-feet of water. From the reservoir the water is led to the south side of the divide, by means of a tunnel about 3,000 feet long, and after turning the waterwheels of two electric plants, the water flows down the Guamaní River for a distance of two miles, and thence is diverted into the Guamaní Canals. The eastern one of these canals has a length of 4 miles, and the western one 14 miles, both irrigating some 5,000 acres of land. The Melanía Reservoir located at a lower level than that of the canal, has a capacity of 300 acre-feet.

The Guayabal Dam.—This is considered the most important structure of its kind in this country. It is located on the Jacaguas River, at a distance 2½ miles north of Juana Díaz, built of reinforced concrete and graceful in design. At its highest point it rises 115 feet above the bed of the river, and carries on its crest a bridge nearly 1,700 feet long, the longest in the Island, which forms part of the state road from Juana Díaz to Ciales. To feed

¹ One acre-foot of water means enough liquid to cover one acre of land one foot deep.

all the water of this dam not only the flow of the Jacaguas River has been used, but the Toro Negro River together with the Doña Juana and Navaja creeks, flowing down the northern slope, have been diverted, by means of a tunnel nearly 2,800 feet long, to the valley of the Jacaguas. The capacity of the Guayabal dam is about 9,500 acre-feet; height above the sea level, 325 feet.

Juana Díaz Canal.—Starts at the Guayabal Dam, and ends at a point in the River Jueyes, 3 miles west of the town of Salinas. The object of this canal is to irrigate some 15,000 acres of land, by means of lateral and sub-lateral smaller canals. The total length of the main artery is more than 21 miles.

The Coamo Dam.—Built also of reinforced concrete, has a capacity of 2,700 acre-feet of water. The liquid is turned into the Juana Díaz Canal which crosses the Coamo River a short distance below the dam.

The Hydroelectric Plants.—Two plants installed in Carite, and utilizing the water drawn from that reservoir, have a combined capacity of 2,500 horse power. Electric energy is distributed, by means of high-tension lines, from Patillas to Juana Díaz for all kinds of industrial purposes, particularly for the operation of pumping machinery and illumination in the towns of Patillas, Arroyo, Guayama, Salinas, Santa Isabel, Coamo and Juana Díaz.

Other Works Projected.—The results obtained in the Island with the use of irrigation has led to a further extension of the system, and the day is not far when every region of the Island needing irrigation will have it. Important works have been planned in several districts, the largest ones being those of Ponce—Juana Díaz, for the irrigation of some 15,000 acres of land; the Lajas project, calculated for 12,000 acres, and the Isabela system which will improve 15,000 acres more.

The total revenue obtained by the Insular Government from the irrigation works in operation amounts to some \$2,000,000 gross.

XVI

LIGHTHOUSES

Under the supervision of the Federal Government (Lighthouse Service) there are in operation the following works of this kind in the territory of Porto Rico.

Location	Height <i>Feet</i>	Visibility <i>Nautical miles</i>	Color of light
San Juan (Morro)-----	180	18	White
Cataño Range-----	12 and 55½	----	White
Anegada Shoal Range-----	11 and 28	----	Red
Capé San Juan-----	260	18	White and red
Cabras Island-----	78	14¼	White
Culebrita Island-----	305	12¾	White
Point Mulas (Vieques)-----	68	7½	White
Port Ferro (Vieques)-----	68	13½	White
Point Tuna-----	110	18	White
Point Figuras-----	47 S	12	White
Jobos Harbor-----	33	----	White
Muerto Island-----	297	18	White
Cardona Island-----	46	7½	Red
Ponce Harbor Range-----	15 and 44	----	Red
Guánica-----	117	8	White
Cape Rojo-----	121	18	White
Moua Island-----	231 S	20	White
Mayagüez Harbor Range-----	9 and 50½	----	Red
Point Jigüero-----	69 S	8	White
Point Borinquen-----	65	12	White and red
Arecibo-----	120	17	White

XVII

CITIES AND TOWNS

San Juan.—The oldest, largest and richest city in Porto Rico is its capital, San Juan, the population of which is now about 75,000. The greater city is formed by the old section, or San Juan proper, and the suburbs of Puerta de Tierra and Santurce, along the military road, in which direction the city is rapidly spreading inland, until the town of Río Piedras, 12 kilometers to the south is now almost reached.

The first two named settlements, as well as the Marina, or south water front, are located in an island little more than 2½ miles long and from one-fourth to one-half mile in width, ending at the western end by a precipitous bluff some 100 feet high overlooking the entrance to the harbor. On this bluff is located Morro Castle, the ancient Spanish fortification which formerly defended the port. Other fortifications extend eastward along the ocean front nearly a mile, as well as for some distance along the bay front, and form a part of the walls and other defensive works which, with their

At the eastern end of this island there are several bridges over moats and gates, made San Juan a typical old city.

San Antonio Channel, which connects the ocean with San Juan bay. Crossing over the bridges, and leaving to the left a beautiful lagoon and old San Gerónimo fort, Santurce, a residential quarter of the city, is reached; Condado, Miramar, Melilla, Minillas, Seboruco, etc., are the names under which different parts of Santurce are locally known. Santurce is also a small island, which joins at its eastern end, by means of old Martín Peña Bridge to the mainland of Porto Rico. According to official figures more than one-half of the population of the capital lives in Santurce.

Aside from being the seat of government, San Juan is the intellectual, financial and commercial center of the country. With its eight daily papers, its educational institutions, its thirty churches and houses of worship, its twelve theaters and amusement places and its up-to-date means of communication, the capital of Porto Rico is really an active metropolitan center from which human life and thought radiate toward the interior of the Island and outward to the whole world. The city is growing rapidly, it being only a question of a few years when its population will be counted by the hundreds of thousands. At present there are more than one hundred and fifty thousand souls living within a radius of fifteen kilometers from San Juan City Hall, less than half hour's time by automobile.

The city has some half dozen social clubs splendidly housed in beautiful, modern buildings, a chamber of commerce and many civic and benevolent societies. Its educational facilities are of the best, there being enrolled in the public and private schools and colleges more than 12,000 pupils.

Commercially, San Juan stands only second to Havana among Antillian cities, and the extensive improvements now going on in the port, to make it accessible for the largest vessels afloat, will give a tremendous impetus to its commercial importance. There are ten modern wharves along the congested water front, and about one dozen steamship lines call regularly at San Juan. Three cable lines and several wireless plants, both government (federal) and private, keep up constant communication with the outer world, while the furthestmost corner of the Island is within easy reach of San Juan by the most up-to-date means of communication.

Industrial San Juan is also forging ahead, though the real industrial development is awaiting for the public improvements which will bring about the transformation of the city in so many directions. Among the many industrial establishments located at San

Juan there are three large foundries and iron works, two large and many small tobacco, cigar and cigarette factories, and hat, shoe, clothing, ice, soap, chocolate, candy, soup paste, food products, marble, printing and binding, furniture, trunk and valise, mineral and soda water and several other kinds of industrial works and shops.

San Juan has imposing public and private buildings. Among the old, historical ones, the following may be mentioned: *Casa Blanca* (White House) built in 1523, by García Troche a son-in-law of the conqueror of Porto Rico and discoverer of Florida, Juan Ponce de León; the *Catedral*, where the remains of the famous conqueror himself are at rest; San José Church, the oldest building in the Island; *La Fortaleza* or Santa Catalina Palace (Government House), started, as a fort, in 1533; Ballajá Barracks, and the City-Hall, facing the main plaza, or Bardorioty Square. Of modern public buildings, the more remarkable ones are the schools, which are veritable palaces; the Capitol, the Federal Building, the Carnegie Library, the Railway Station. The superb structures of the various banks, the modern office and commercial buildings, some of which rise as many as seven stories, and the high-class hotels complete the picture of a modern, busy city. The total value of real and personal property in the Capital of Porto Rico is put at more than seventy million dollars.

Historically, San Juan is the most important of the cities of Porto Rico. In 1508 Ponce de León (whose statue may be seen at San José Square) founded Caparra, the first European settlement in the Island, to the south of San Juan Bay, as that location behind the marshes offered natural protection against the pirates and other enemies of the times. A few years later, however, the unhealthy place had to be given up, and the colony moved to the small islet where San Juan proper actually stands. As a military station or *presidio*¹ San Juan became famous as years went by, and the system of fortifications transformed gradually the natural stronghold into one of the main points of support of the Spanish empire in America. Accordingly, heroic San Juan was attacked several times by the enemies of Spain; in 1595, by the famous English pirate Francis Drake; in 1598 by the English again under George Clifford, Count of Cumberland, who succeeded in capturing the city, but had to give it up a few months later on account of an epidemic; in 1625 by the Dutch commanded by Boudoin Henry, who was routed a

¹ The word *presidio* meant primarily *military station*.

few weeks after, a monument on Morro Field commemorating the event; and finally in 1797, the English under Harvey and Albercomby, who, a few weeks after landing between six and eight thousand men, had to give up the siege, soundly defeated. San Juan was formally turned over to the army forces of the United States on October 18, 1898, and since then its progress has been accelerated in the manner described.

San Juan has been the birthplace of many eminent Porto Ricans such as Campeche, Tavárez, Blanco, Acosta, Vizcarrondo, Tapia, Oller, Padilla, Gabriel Ferrer, Manuel Elizaburu, etc.

COMMENT.—Ponce de León showed clear judgment in selecting for his colony a spot near the best harbor¹ in the northern coast of the Island, but that does not mean necessarily that the settlement which later on developed was well situated, as a capital for the country. Following the rule of the Spaniards in selecting the locations for the capitals of their empire in tropical America, the capital city of Porto Rico should have been placed somewhere in the high interior, possibly near Cayey or Aibonito, as more or less equidistant from the best ports of the Island. There is where the capital of Porto Rico should be located, and possibly there is where it will be located in the future. Climatic, strategic, social and political considerations are all in favor of placing the capital of this tropical Island somewhere in the uplands, within easy reach from the coast, by rail, motor, and air lines.

When all has been said about the remarkable development of San Juan, particularly within the last fifteen years, the fact remains that nothing has been done intelligently towards the solution of some of those fundamental problems for the development of real civic spirit and life in a modern capital city. Transportation, for instance, is deficient and expensive for both passenger and freight; living in San Juan is well-nigh beyond the means of the average working citizen; the water supply has been always inadequate, and apparently will be so in the near future; and last but not least, parks, museums, zoölogical and botanical gardens are urgently needed, in order to place San Juan where it should be, among the leading cities of the tropics.

Ponce.—The city of Ponce is second only to San Juan. The population of its municipal district is about 75,000 of which some 45,000 live in the city itself, including the Playa or port; the as-

¹ Good port was actually meant when the words *Puerto Rico* were first applied to the settlement.

sessed value of the real and personal property is about \$25,000,000, with \$500,000 of public revenue.

Although the city is not very well situated, because of exposure to occasional floods from the Portugués River, its climate is pleasant, the temperature being lowered by the constant breezes prevailing during the greater part of the year; and what is more, a civic spirit the equal of which could hardly be found anywhere in Porto Rico, in spite of many natural disadvantages has made of Ponce one of the most attractive towns of the Island, and in several respects the rival of San Juan itself.

Ponce has very good parks and plazas, and the architecture of many of its public and private buildings shows a highly refined taste. The city is well provided with first-class up-to-date hospitals, public and private, benevolent institutions of several kinds, about fifteen churches, several theaters, two daily papers and more than 200 school in the municipal district (more than half in the town itself) to which there is an attendance of some 10,000 pupils. There are besides several first-class private educational institutions, in which over 500 more students are cared for. Finally, there are three first-class clubhouses in the city and at a short distance, the Quintana Thermal Springs add attractiveness to the place.

Commercially and industrially, Ponce is trying hard to hold the position of preëminence it has had in the past. The natural shipping and distributing port for a rich sugar-cane and coffee territory, and the terminus of two central high roads and of the American Railway line, there is no reason why the city should not recover her ancient prosperity, as soon as the dredging of the port, which is about to be started, improves its maritime conditions. There are several banks and quite a number of very rich commercial and industrial firms established in Ponce and its district. The principal manufactures of the town are cigars and cigarettes, soda and mineral waters, hats, shoes, clothing, laces, embroidery, cut diamond, foundry and iron products, ice, bricks, chocolate, soap, candy, soup paste, etc.

The history of Ponce ought to be a source of pride to its inhabitants. Though the name of the town appears in public documents since early in the history of colonization, it is a fact that the insignificant village which it was still up to the beginning of the XIX century was a dependency of Coamo, where the seat of the municipality was located. Early in that century Ponce was declared an open port, but a great fire occurring in 1806 almost

wiped out the whole place. By 1836, however, recovery had been in such a way, that the seat of local government was transferred to Ponce from old Coamo. A great impetus was given to the progress of the city by many of its enthusiastic citizens, the climax being reached in 1882 when the locally famous *Fair* was held, and the record-breaking figure of 80,000 visitors from the whole Island attended. To-day the Firemen's Quarters, located back of the Guadalupe Church in the main plaza is what reminds one of the event, as an everlasting memorial to the patriotic spirit of the southern city, and as a tribute to something that is typical of Ponce and its organizing genius: the Municipal Fire Corps. The composer Morel Campos, the historian Neumann and Federico Degetau were born here.

Mayagüez.—Third in importance among Porto Rican cities is Mayagüez, whose population is about 45,000 in the municipal district and 20,000 in the town itself. The assessed value of real and personal property is about \$10,000,000, the public income amounting to something like \$160,000.

Mayagüez is beautifully situated on the western coast of Porto Rico, overlooking the Mona Passage, and is the natural distributing point for a large and rich territory planted with sugar cane, coffee and fruit groves; consequently its preëminent commercial standing in the past has not been due to artificial causes or mere luck, but to a combination of natural circumstances, besides the fundamental one of possessing a commodious harbor which affords safe anchorage to the large vessels which call there from various parts of the world. A number of active industries contribute to enhance the value of this progressive community.

Mayagüez has all the advantages and comforts of a modern city. The American Railroad has two stations within the city limits, a local electric line connects the city with the port, and the communications with the tributary towns and the rest of the island are as good as they can be anywhere in Porto Rico. The city has one daily paper, two social clubs, modern hospitals, good hotels, and its educational facilities are of the best, having over 100 public schools with an enrollment of nearly 7,000 pupils, and besides the College of Agriculture and Mechanic Arts, of the University of Porto Rico. The Correctional School for delinquent minors is also located here, as well as an Experimental Station conducted by the Federal Department of Agriculture.

But the western city has had bad luck in the past: twice in

history it has been the victim of awful calamities which have almost wiped it out of existence. In 1841 a conflagration destroyed the town almost entirely, and in order to help it to recover General Méndez Vigo, the ruling Spanish governor transferred the entry port privilege from Cabo Rojo to Mayagüez. In 1918 a terrific earthquake left almost no stone unturned in the western city, but like the mythical Fenix, the plucky, energetic town is rapidly growing again out of her own ashes.

Undoubtedly the fruit business can do much for Mayagüez. Asenjo, Monge, Sama, among other distinguished men, were born here.

Arecibo.—This is a very important town situated upon the north coast of the Island, close to the mouth of the Grande de Arecibo river. Its population is more than 10,000 in the city itself and about 50,000 in the municipal district.

The port itself is far from good, being no more than an open roadstead without protection against the local northers; but the time must come when Arecibo will possess a first-class artificial harbor, and then it will be difficult for any other town in Porto Rico to hold a second place. This statement is made in view of the record made by Arecibo in spite of tremendous natural handicaps, and considering that the rich sugar-cane, coffee and fruit lands tributary of Arecibo are served by the best means of communications. The city is connected with San Juan, 50 miles to the east, by rail and high roads, which also extend toward the west, in the direction of Aguadilla; while the interior is tapped by two first-class through roads, one going to Lares and the other to Utuado, and both radiating from Arecibo. In the town itself there are located several industrial establishments which greatly contribute to its business activity.

The fourth of Porto Rican cities is very well equipped with modern improvements, and its religious, charitable, social and educational institutions are numerous and well organized. The city has a daily paper, hospitals, theaters, and its commercial stores are as well supplied as those in any other first-class city of the country.

San Felipe de Arecibo is one of the oldest towns in Porto Rico, its municipal government having being organized in 1616. In 1702 a landing party from two English men-of-war met with defeat at the hands of a few militiamen commanded by Captain Correa. This feat of arms won for the town the official title of "Most Loyal",

bestowed by King Philip V, and its popular motto "La Villa del Capitán Correa."

Arecibo is the birth place of the historian Coll y Toste.

Caguas.—By far the most important of inland towns, and fifth among all the cities of the country is Caguas, whose urban population is over 12,000, there being some 40,000 inhabitants in the entire municipal district. The total assessed value of real and personal property is more than \$6,000,000.

As a communication center the importance of Caguas is great. The Capital, 40 kilometers to the north, is reached by rail and by the famous military road, while Humacao, San Lorenzo, Cayey and Aguas Buenas have also first-class road communication with Caguas.

The city is in the center of the tobacco region of the Island, establishments where the leaf is manipulated and made into cigars and cigarettes being numerous in Caguas. Two sugar mills are also located in the district.

Caguas, the city, always looks prosperous and active, many transient people passing through it every day. It possesses all modern conveniences, and although much remains to be done before the old town is transformed into a first-class modern city, there is no doubt that the energy and enthusiasm of its patriotic citizens will accelerate a splendid future not very far off.

The city has a weekly paper, social clubs, and many public and private schools, with a total attendance of over 5,000 pupils. The name of the town is derived from that of the Indian Chief Caguax of which History speaks as being very friendly to the first white settlers in the colony. The poet Gautier Benítez is one of the several illustrious sons of Caguas.

Guayama.—As one descends from the heights of Carite, along the splendid road connecting Cayey with the port of Arroyo, at one of the many turns of the road a first, magic glimpse is taken of Guayama, second in importance among the towns of the southern coast. The city, which is admirably situated upon healthful high ground, has a population of 8,000 in the town itself, and 20,000 in the municipal district. The total wealth, about \$6,000,000, is mostly in the sugar business.

Commercially the place is quite important, being near two ports, Arroyo only four miles away and Jobos, one of the best harbors in the Island, and where the sugar mill of the great Aguirre Central is located. Ponce, some 40 miles to the west, is reached by rail as

well as by high road. It is said that the word "Guayama" means in Indian language "the region of fire".

Humacao.—This town, the most important one of the east coast of Porto Rico, stands 65 kilometers from San Juan, with which city it is connected by way of Caguas, through the center, and by Fajardo, along the coast. The population of the municipal district is over 20,000, of which some 6,000 live in the town itself. Total wealth, over \$5,000,000.

In the center of a fertile valley, with the sea about 6 miles towards the east the situation of Humacao is excellent, both for its picturesque surroundings and as a center of wealth. Sugar cane, tobacco and pasture, in the lowlands, and coffee on the heights, are the products of the region. There are two important sugar mills located in the district.

Humacao is a very progressive city; its educational, religious, social and charitable establishments show an up-to-date spirit in its inhabitants, which hardly could be better anywhere in Porto Rico.

Aguadilla.—The largest city in the northwestern corner of the Island is Aguadilla, whose importance as a port, however, has been lately on the decline. The city, which lies upon a narrow strip of land between the sea and a high ridge, is connected by rail and high road with the other coast towns. The population of the municipal district is about 25,000 souls with some 8,000 living in the town itself. The total assessed wealth is about \$2,500,000.

According to tradition, Columbus' fleet of discovery, in 1493, refilled its water casks at the fountain which up to this day flows in the center of the town, and to which it owes its popular name *La Villa del Ojo de Agua*, but the real fact seems to have been that it was at the Pozos de la Aguada where the fleet replenished its water supply. On the right bank of the Culebrinas River, not far to the south of Aguadilla stands the stone monument marking the landing place of the discoverers, in 1493.

The city is well supplied with religious and educational establishments. Aguadilla has the distinction of having been the birth place of the naturalist Stahl and the orator de Diego.

Fajardo.—Situated some 2 miles from San Juan Heads, the northeastern corner of the Island, is Fajardo, whose urban population is about 7,000, there being some 15,000 souls in the whole municipal district.

The city is connected by high roads with other towns, being situated on the circumvallation road of Porto Rico. There is daily

communication by gasoline launches with the important island of Vieques, a few miles to the southeast. The main source of wealth of the region is sugar, the third largest mill of the Island being located here. Total real and personal wealth amounts to about \$5,000,000.

San Germán.—This, the second oldest town in Porto Rico, stands on a series of hills in the southwestern corner of the Island, some five or six miles from both the Mona Channel in the west and the Caribbean Sea in the south.

The population of the municipal district is 24,000 and that of the city about 5,000. The total wealth amounts to some \$3,000,000, the main agricultural crops being sugar, coffee, and fruits. There are two banking institutions and a brisk commerce in the place.

San Germán, called sometimes *The City of the Hills* (*Ciudad de las Lomas*), because of its situation, enjoys a delightful climate, and its location is a very picturesque one, overlooking the valley of the Guanajibo River.

The original settlement, named after Germaine de Foix, second wife of Ferdinand the Catholic, was founded in 1512 by Diego, a son of Columbus, who located it near Añasco, but the place was repeatedly destroyed by the French as well as by the pirates and the Carib Indians, and as a consequence the town was moved from one place to another until it was finally established in its present location, in 1571. In 1748 an English party landed at Guánica and attacked the place, but was repulsed. For many years, when there existed only two municipal districts in the Island, San Germán was the head of the western one, whose eastern limit was marked by the rivers Camuy and Jacaguas.

Manatí.—Midway between San Juan and Arecibo, and three miles from the Atlantic Ocean, is the progressive town of Manatí, whose urban population is 7,000, with over 20,000 in the entire municipal district. The total real and personal wealth reaches about \$4,000,000. The communications by rail and high road are of the best, with both coast and inland places. Sugar, coffee and fruits are the main crops of this fertile region. There is a very important sugar mill located in the district. The town has an active trade and supports one banking institution.

Yauco.—This is one of the most progressive towns in the southern coast, and the coffee grown in the district enjoys a high reputation in the country and abroad. Besides the rich grain, sugar-cane plantations and fruit estates constitute the agricultural wealth

of the district. The total value of real and personal wealth amount to about three and one-half million dollars.

There are 26,000 inhabitants in the district, more than 7,000 of whom live in the town proper. The location of Yauco is a very good one; it is the southern terminus of one of the most important central high roads of Porto Rico, connecting the town with Lares, and opening up a large and rich territory in the interior of the Island. The circumvallation railway and high road give the city of Yauco very good connection with other coastal towns, both east and west.

This prosperous community has been in great part built up by native Corsicans.

Río Piedras.—This town, as already stated, is almost an extension of San Juan. Its urban population is 7,000 there being about 25,000 souls in the entire municipal district. The total real and personal wealth amounts to some \$6,000,000.

The proximity to the capital, with which it is in constant communication by electric and motor vehicles, lends Río Piedras the air of bustling activity of San Juan itself. The circumvallation high road coming from the east has its terminus here, too.

Río Piedras is a university town; on a beautiful spot close to the city are located the Colleges of Law, Liberal Arts and Pharmacy as well as the Normal and Model Schools conducted by the University of Porto Rico whose student body of nearly 2,000 add to the importance of the place. A sugar mill is located not very far from the town.

Nearby are also established the Insular Sanatorium for tuberculous people, a model institution among its kind, and an Agricultural Experimental Station.

Coamo.—This town is located on the central road connecting Ponce with San Juan. Its urban population reaches 4,000 inhabitants, there being about 12,000 more in the rural section. The total real and personal wealth is over \$2,000,000. **Coamo Springs** whose waters have for years been famous for their medicinal properties are located not far from the town, and joined to it by a fine road. There is at the springs a first-class hotel and sanatorium, frequented by persons from all parts of the Island and neighboring countries.

Coamo, founded early in the 17th century, is one of the oldest towns in Porto Rico. In 1898 a small battle was fought near the town, between the retiring Spanish forces and the American Army advancing northward along the military road. After losing nearly

two hundred men among killed and prisoners, the Spaniards retired towards Aibonito.

Lares.—This is one of the most important towns in the interior of the Island; it is beautifully located at an altitude of 1,250 feet above sea level, and on the highways from Arecibo to Mayagüez, and from Aguadilla to Yauco. A projected highway to Utuado, some 15 kilometers to the east, will still enhance the importance of Lares as a converging point of communications in the interior.

Lares has 25,000 inhabitants in its municipal district, some 4,000 of whom are in the town proper. Its real and personal wealth reaches over \$3,000,000. The future of this progressive town is indeed promising; it has a climate which could hardly be excelled in the tropics. The agricultural wealth of the region, particularly coffee, constitutes a solid economic basis. It was here, in 1868, that the *Revolución de Lares*, a revolutionary outbreak, occurred, to be put down immediately by the Spanish authorities.

Guánica, incorporated as a town in 1914, consists of two urban settlements besides the rural zone: Guánica itself, which stands on the left bank of the Susúa River, and Ensenada, on the western shore of the bay, where the largest sugar mill in the country is located. The combined population of the two urban communities is about 7,000 with nearly ten thousand people in the entire municipality. The school registration reaches 1,700; total wealth, more than six million dollars.

Juncos.—The progress of this town has been rapid during the last few years. Situated on the highway between Caguas and Humacao, its urban inhabitants number more than 4,000 with 10,000 more in the rural section.

The total wealth is nearly \$3,000,000, the main products being sugar, tobacco, coffee and fruits. There is a large sugar mill located here.

Cayey.—Sixty-one kilometers south of San Juan, on the military road to Ponce, and 69 kilometers from the latter city, stands Cayey, on an elevated plain some 1,300 feet above the sea level. The town is also connected by a splendid road, 27 kilometers long, with Guayama, directly south, and work is now progressing on another road between Cayey and Salinas. The situation of Cayey, it will be realized, could hardly be better, as a center of communication in the central eastern section of Porto Rico.

The climate is very healthful; Cayey was in the days of Spain

a military station for acclimating troops recently arrived from that country, and at present it is the site of a United States army post.

A powerful radio station, with steel towers 600 feet high, has been established by the Federal Government near Cayey.

The population of the town exceeds 5,000 and 20,000 more in the rural section. Total wealth about \$5,000,000. School attendance, 3,000.

Cabo Rojo.—Puerto Real, or Royal Port, officially open to trade with the rest of the world since 1804, but used in a clandestine manner since early in the history of the colony, gave in days gone by much importance to Cabo Rojo. The town is situated in the southwestern part of the Island, and the district is chiefly devoted to the raising of coffee, sugar cane, tobacco and cocoanuts. A number of the inhabitants are engaged in the collection of salt, of which there exist large deposits along the seashore. The total value of real and personal property is over \$3,000,000. The population of the district is about 23,000 people, of whom more than 4,000 are in the town itself. The school attendance reaches 4,500. Betances, Rius Rivera and Salvador Brau were born at Cabo Rojo.

Utuaado.—Though one of the oldest towns in Porto Rico, Utuaado has been slow to develop because of its comparative remoteness in the interior. But being on the highway from Arecibo to Ponce, and the converging point of other roads proposed, to Lares, to Manatí and to Jayuya, there is no doubt that the community will reach the level it deserves, as the center of an agricultural region in which coffee, sugar cane, tobacco, fruits and other products are or may be raised in important quantities.

The population of the district is more than 35,000 inhabitants some 3,000 of whom live in the town itself. The school attendance is 5,000 and the total wealth reaches nearly \$4,000,000.

Bayamón.—The city of Bayamón is located at a distance of 7 kilometers from Cataño, this suburb standing across the bay from San Juan, with which gasoline ferries keep up constant communication day and night. The municipal district has a total population of 30,000 of whom 10,000 live in Bayamón itself and 7,000 in Cataño. The school attendance is about 6,000; the wealth, nearly \$7,000,000.

Bayamón has rail and high-road connection with coastal and interior towns, being the northern terminus of through high ways to Corozal, Comerío and Aguas Buenas.

The main agricultural products are sugar cane, tobacco and

fruits. There are sugar mills and cigar factories located in the district. Bayamón has the distinction of being the birth place of Dr. José Celso Barbosa.

Loíza, the municipality, has a population of 16,000, of whom some 3,000 live at Canóvanas (New Loíza) and about 1,000 live in the old Loíza town (Aldea Loíza). The latter stands on the right bank of the Grande de Loíza River, precisely at its mouth, while Canóvanas is situated inland, on the circumvallation high road. The sources of wealth of Loíza are sugar cane, coffee and cocoanuts, there being an important sugar mill located at Canóvanas.

The new town at Canóvanas was laid out in the year 1908, under American sovereignty, and by legislative action declared the seat of the municipality.

Other Towns.—**Luquillo** (the birth-place of Matienzo), **Río Grande**, **Carolina**, **Trujillo Alto**, **Guaynabo** (the birth place of Baldorioty), **Toa Alta**, **Toa Baja**, **Dorado**, **Vega Alta**, **Barceloneta**, **Hatillo**, **Camuy**, **Quebradillas** and **Isabela** (where Manuel Corchado was born) are small towns of the northern plain of Porto Rico. **Moca**, **Aguada**, **Rincón**, **Añasco** (the birth-place of de Hostos) and **Hormigueros** lie in the west. **Lajas**, **Sabana Grande**, **Peñuelas**, **Santa Isabel**, **Patillas** and **Maunabo** are in the south, and **Ceiba** in the east. All these are small towns, whose agricultural products are in the main sugar, cattle and fruits.

Guayanilla and **Arroyo** in the southern coast, and **Naguabo** in the east, are sea ports, and consequently their importance is greater because of the shipping of sugar particularly.

At **Ensenada**, close to **Guánica**, and **Aguirre**, near **Salinas**, are located the largest sugar mills in the country.

San Sebastián, or **Pepino**, **Las Marías** and **Maricao** are beautiful communities of the western part of the Island, whose inhabitants are on the main devoted to the raising of coffee and fruits.

Peñuelas, **Juana Díaz**, on the Central highway going from San Juan to Ponce, and **Villalba** a little further north, produce sugar cane, coffee, fruits and cattle.

Yabucoa is a very progressive little town in whose district sugar cane and cattle are mainly raised; a sugar mill and a banking institution are located here. The sweet poet Santiago Vidarte was born at Yabucoa.

Las Piedras, **San Lorenzo**, **Gurabo**, **Cidra**, **Aguas Buenas**, **Coro-**

zal, **Morovis** and **Ciales** are small towns of the interior. In their districts, sugar cane, tobacco, coffee or fruits are raised.

Barranquitas (the birthplace of Muñoz Rivera), **Aibonito**, on the central military road, **Barros**, which stands 1,700 feet above sea level, **Jayuya** and **Adjuntas**, nearly 2,000 feet high, are mountain towns possessing a very cool and agreeable climate all the year around, and therefore are becoming more and more the summer residence of those living elsewhere in Porto Rico.

Beautiful **Naranjito** has the reputation of being the most healthful spot in the Island. The annual rate of mortality for the last ten years has been less than fifteen per thousand.

XVIII

THE ISLANDS

Vieques (or **Crab**) **Island**, lying some 9 miles off the coast of Ceiba, is geologically speaking, a prolongation of the mainland of Porto Rico; nowhere is the channel more than 60 feet deep, it being in general a great deal less.

From Arenas Point to East Point, the distance is about 20 miles, and from Puerto Mula Lighthouse, in the north, to Puerto Ferro Lighthouse, in the south, the widest part of the island, the distance is nearly four miles. The total surface is 51.5 square miles.

Vieques is generally low lying, made up of old land rocks. A central chain of hills running pretty nearly the whole length of the island is called *Tinajas* in the west and *Jaloba* in the east. Puerto Mulas, and Puerto Diablo in the north, and Puerto Real, Puerto Mosquito and Puerto Ferro in the south, are the main points of anchorage.

Sugar cane, for which there are four important centrals, constitutes the main source of wealth in the island. The total real and personal property reaches about \$5,000,000.

Isabel II, in the north, is the only town in Vieques. The population is about 12,000, of whom one-third live in the town. The total public school attendance is over 2,000 in the whole municipality, or island. Daily communication by gasoline launches is kept up with Fajardo and Ceiba, while by means of a heliographic apparatus messages are constantly flashed between the mainland of Porto Rico and its small island dependence. A seismographic station is kept by the Federal Government in Vieques.

It is said that the country was first settled by white people in

1524, when Don Cristóbal de Mendoza was the Spanish governor of Porto Rico.

Culebra.—Lying some 15 nautical miles east of Fajardo and 8 miles north of Vieques, is the small island of Culebra, in whose splendid Great Harbor, on the southern coast, the American War Fleet occasionally assembles for its winter manoeuvres. The total area of this irregularly-shaped island is 11 square miles, and the population is about 1,000. The total wealth amounts to about \$300,000. **San Ildefonso**, the small urban community of Culebra, is provided with public schools, there being a total attendance of 200.

Mona.—This island, whose area is 19.5 square miles, is situated 50 miles to the southwest of Porto Rico, from which it cannot be seen except from the higher summits, and it then appears as a low haze on the horizon.

This island is rather circular in shape, and its elevated surface is almost horizontal, ending abruptly on all sides in cliffs 150 to 200 feet above the sea.

The entire island is literally honey-combed with caves, there being practically no vegetable soil on it. Passing across over the top of the plateau is extremely arduous on account of the sharp and jagged surface of the limestone and the abundant growth of cactus. The whole island is as arid and desolate as Vieques is green and cultivated. Wild hogs roam about and different species of sea birds are also to be found, *along with wild goats.*

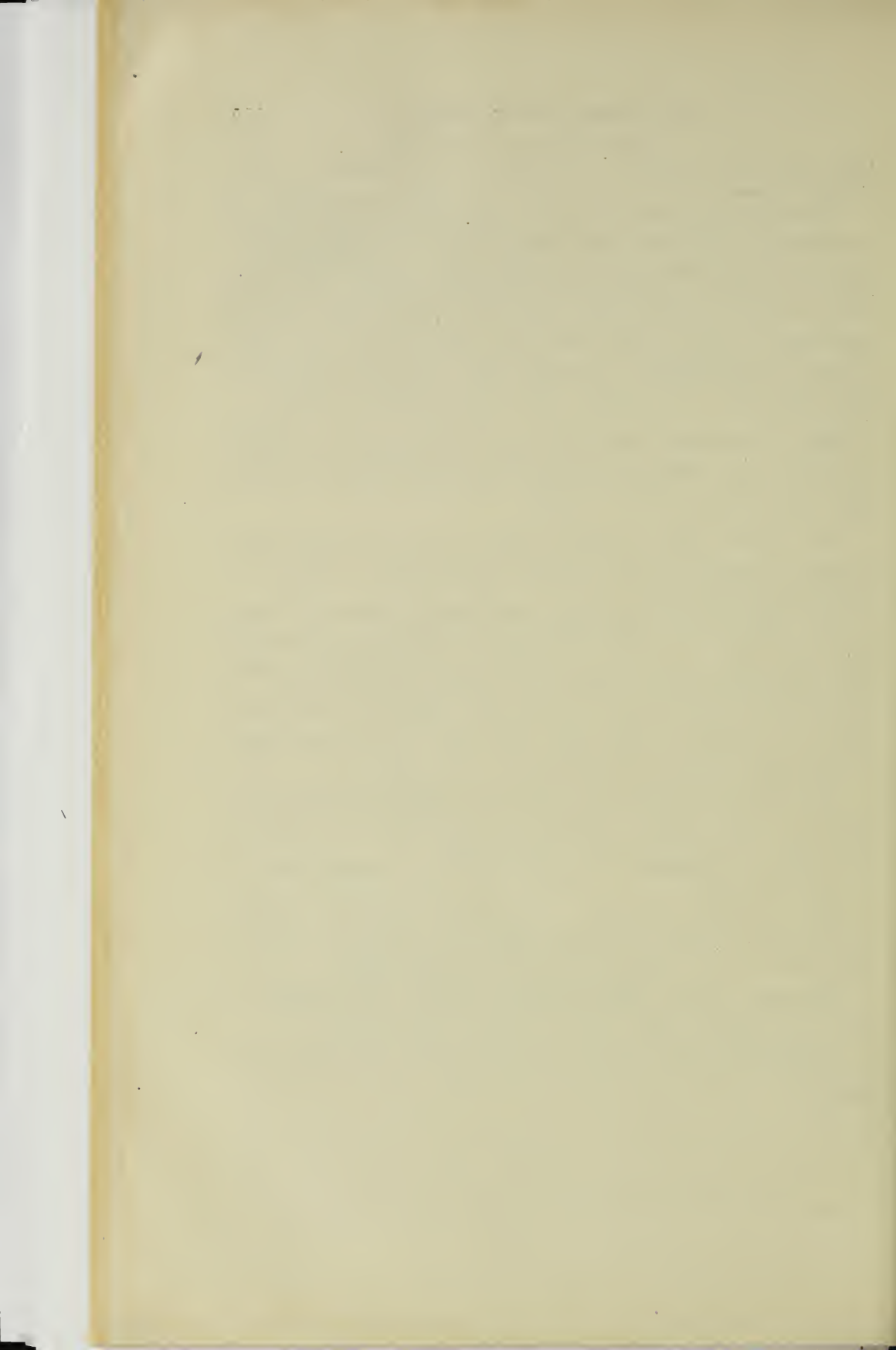
Aside from the keepers of the East Cape Lighthouse, near Playa Pájaro, the only human inhabitants of the island are the laborers who collect the fertilizing guano at the caves.

Monito and **Desecheo**, as already stated, are isolated peaks in the Mona Passage.

Caja de Muertos, **Berbería** and **Cardona** are off the southern coast, between Ponce and Santa Isabel. As explained, the first mentioned of these islands is rich in fertilizing guano.

Palominos, **Piñero**, **Medio Mundo**, **Santiago** and **Cabras** are close to the eastern coast, between Fajardo and Humacao.

Cabras Island, close to the entrance of San Juan port, is the seat of a leper colony, under the supervision of the Department of Health.



APPENDIXES

APPENDIX "A"

PHYSICAL DATA

Towns	Height in feet ¹	Mean annual temp. (F.)	Mean annual rainfall
Adjuntas -----	1,700	71.8	88.44
Aguada -----	23	-----	-----
Aguadilla -----	34	76.9	80.29
Aibonito -----	2,000	71.8	65.41
Añasco -----	25	77.3	-----
Arecibo -----	50	77.1	59.4
Arroyo -----	20	-----	-----
Barranquitas -----	1,700	-----	-----
Barros -----	2,000	72.5	76.72
Bayamón -----	75	77.0	75.87
Caguas -----	250	75.8	67.87
Carolina -----	39	78.6 ²	79.54 ²
Cayey -----	1,300	74.3	68.35
Ceiba -----	34	-----	-----
Ciales -----	367	-----	-----
Cidra -----	1,300	73.5	83.14
Coamo -----	350	77.5	52.45
Comerio -----	500	75.3	-----
Corozal -----	400	76.3	78.72
Culebra -----	50	79.1	-----
Fajardo -----	35	79.4	69.35
Guánica -----	50	77.3	37.16
Guayama -----	244	-----	55.36
Guayanilla -----	49	-----	-----
Gurabo -----	183	-----	-----
Hatillo -----	7	-----	-----
Humacao -----	60	76.6	86.40
Isabela -----	250	77.9	57.85
Juana Díaz -----	200	78.8	49.36
Juncos -----	226	-----	-----
Lajas -----	100	77.1	-----
Lares -----	1,400	74.4	92.32
Las Marías -----	1,000	75.2	107.77
Luquillo -----	10	-----	-----
Manatí -----	85	77.4	69.45
Maricao -----	1,400	72.4	-----
Maunabo -----	40	79.7	81.96

¹ All heights approximate.

² Canóvanas.

APPENDIX "A"—Continued

PHYSICAL DATA—Continued

Towns	Height in feet ¹	Mean annual temp. (F.)	Mean annual rainfall
Mayagüez	50	74.4	80.07
Moca	141	-----	-----
Morovis	700	75.08	87.19
Patillas	66	-----	-----
Peñuelas	197	-----	-----
Ponce	50	78.3	40.57
Quebradillas	197	-----	-----
Río Piedras	75	71.6	71.06
Sabana Grande	283	-----	-----
Salinas	23	-----	-----
San Germán	200	77.4	68.12
San Juan	100	78.2	63.98
San Lorenzo	200	76.5	83.27
Santa Isabel	22	78.1	40.67
Utuado	500	77.0	81.94
Vega Baja	23	22.9	-----
Vieques	45	76.9	48.59
Villalba	403	-----	-----
Yabucoa	100	-----	87.70
Yauco	200	77.04	48.00

APPENDIX "B"

THE HIGHEST MOUNTAINS IN PORTO RICO

Name	Location	Height Feet
Not named	Jayuya	4,400
Los Picachos	Ciales	4,310
Ala de la Piedra	Barros	4,225
Peak next to it	Barros	4,095
Not named	Ciales	3,960
Peak next to it	Ciales	3,950
Silla de Guilarte	Adjuntas	3,950
Toro Negro	Barros	3,615
Sillas de Calderón	Yauco	3,582
Not named	Villalba	3,566
Pico de la Batalla	Adjuntas	3,533
Not named	Yauco	3,497
Yunque	Luquillo	3,483
Carnero (East Peak)	Luquillo	3,457
Toro (West Peak)	Luquillo	3,346
Not named	Barros	3,440

¹ All heights approximate.

APPENDIX "B"—Continued

THE HIGHEST MOUNTAINS IN PORTO RICO—Continued

Name	Location	Height Feet
Pilón de Azúcar-----	Peñuelas-----	3,431
Not named-----	Yauco-----	3,410
Sepultura-----	Barros-----	3,310
Sepultura-----	Cayey-----	3,002
Mata de plátanos-----	Peñuelas-----	2,978
Pico del Medio-----	Peñuelas-----	2,970
Torreilla-----	Barranquitas-----	2,953
Torito-----	Cayey-----	2,815
Not named-----	San Germán-----	2,624
Jájome-----	Cayey-----	2,611
Asomante-----	Aibonito-----	2,395
Frailé-----	Yauco-----	2,348
Tetas de Cerro Gordo-----	San Germán-----	2,210
Pinto-----	Ponce-----	2,054
Raspa Pela-----	Patillas-----	2,034

Besides, eight other peaks in the Luquillo System range in height from 2,000 to 3,400 feet.

APPENDIX "C"

DEMOGRAPHIC DATA

	Population, 1920		Births 1921-1922	Deaths 1921-1922	School enrollment, 1922
	Municipality	Town itself			
Adjuntas-----	17,988	1,729	728	392	3,063
Aguada-----	12,981	1,078	471	475	1,986
Aguadilla-----	24,287	8,035	756	646	4,979
Aguas Buenas-----	10,741	1,999	491	198	1,464
Aibonito-----	13,264	2,281	462	197	2,076
Añasco-----	13,834	2,552	533	499	2,461
Arecibo-----	46,578	10,039	1,846	1,184	7,649
Arroyo-----	7,074	3,025	235	118	1,797
Barceloneta-----	13,442	1,316	608	314	1,710
Barranquitas-----	11,600	896	364	155	1,875
Barros-----	15,758	1,204	439	210	3,449
Bayamón-----	30,739	10,411	1,268	790	5,684
Cabo Rojo-----	22,412	4,327	1,015	517	4,139
Caguas-----	35,920	12,149	1,234	965	6,706
Camuy-----	14,228	1,630	491	302	2,212
Carolina-----	15,563	3,151	535	330	3,218
Cayey-----	23,618	5,243	929	574	3,045
Ceiba-----	5,973	847	242	175	1,113
Ciales-----	20,730	2,233	625	355	3,284
Cidra-----	14,789	1,696	655	228	1,839
Coamo-----	17,749	4,259	688	287	3,748

APPENDIX "C"—Continued

DEMOGRAPHIC DATA—Continued

	Population, 1920		Births 1921-1922	Deaths 1921-1922	School enrollment, 1922
	Municipality	Town itself			
Comerio	14,708	2,383	655	202	2,210
Corozal	14,369	1,747	1,130	231	2,266
Culebra	839	265	42	11	146
Dorado	5,842	1,163	212	113	1,245
Fajardo	14,312	6,571	582	443	2,657
Guánica	9,948	2,103	365	187	1,508
Guayama	19,192	8,924	698	490	3,829
Guayanilla	12,083	1,434	465	276	2,165
Guaynabo	10,800	686	388	171	1,418
Gurabo	12,882	2,550	399	241	1,992
Hatillo	13,979	724	512	258	1,639
Hormigueros	4,584	538	183	102	697
Humacao	20,229	6,183	748	514	3,926
Isabela	19,809	1,699	427	267	2,745
Jayuya	12,463	1,063	470	167	1,897
Juana Díaz	18,529	2,211	746	491	3,120
Juncos	13,151	4,263	543	315	2,231
Lajas	11,908	983	491	207	2,278
Lares	25,197	2,693	1,161	508	3,969
Las Marías	10,736	531	389	185	2,053
Las Piedras	10,620	618	389	194	1,678
Loíza	15,804	1,077	471	309	2,746
Luquillo	6,251	1,242	259	179	1,199
Manatí	20,100	6,147	577	493	2,593
Maricao	8,291	740	268	162	1,959
Maunabo	7,973	908	194	148	1,274
Mayagüez	41,612	19,124	1,283	1,420	6,170
Moca	15,791	1,717	326	339	1,977
Morovis	14,660	1,218	540	212	2,194
Naguabo	15,788	3,691	701	445	2,177
Naranjito	10,503	1,223	425	143	1,698
Patillas	14,284	1,693	608	300	2,225
Peñuelas	13,598	1,343	523	208	2,065
Ponce	71,426	41,912	2,132	1,937	12,146
Quebradillas	9,404	1,420	355	167	1,756
Rincón	8,476	514	321	221	1,333
Río Grande	13,247	1,962	552	349	2,622
Río Piedras	23,635	5,820	969	558	5,257
Sabana Grande	12,305	2,856	582	286	2,179
Salinas	12,971	1,385	519	295	2,235
San Germán	23,843	5,019	987	626	4,171
San Juan		71,443	2,515	1,739	11,193
San Lorenzo	18,136	3,662	680	310	2,661
San Sebastián	22,049	2,611	830	430	3,406
Santa Isabel	7,257	1,143	267	227	1,376

DEMOGRAPHIC DATA—Continued

APPENDIX "C"—Continued

	Population, 1920		Births 1921-1922	Deaths 1921-1922	School enrollment, 1922
	Municipality	Town itself			
Toa Alta -----	10,505	1,172	316	174	1,870
Toa Baja -----	7,121	1,559	279	134	1,716
Trujillo Alto -----	7,470	539	328	155	1,351
Utua -----	35,135	3,700	1,332	609	5,212
Vega Alta -----	9,970	2,142	151	157	1,711
Veja Baja -----	15,756	3,607	704	409	2,666
Vieques -----	11,651	3,424	533	305	1,877
Villalba -----	13,040	626	362	204	1,742
Yabucoa -----	19,623	2,888	409	474	3,714
Yauco -----	25,848	7,053	1,003	748	4,470

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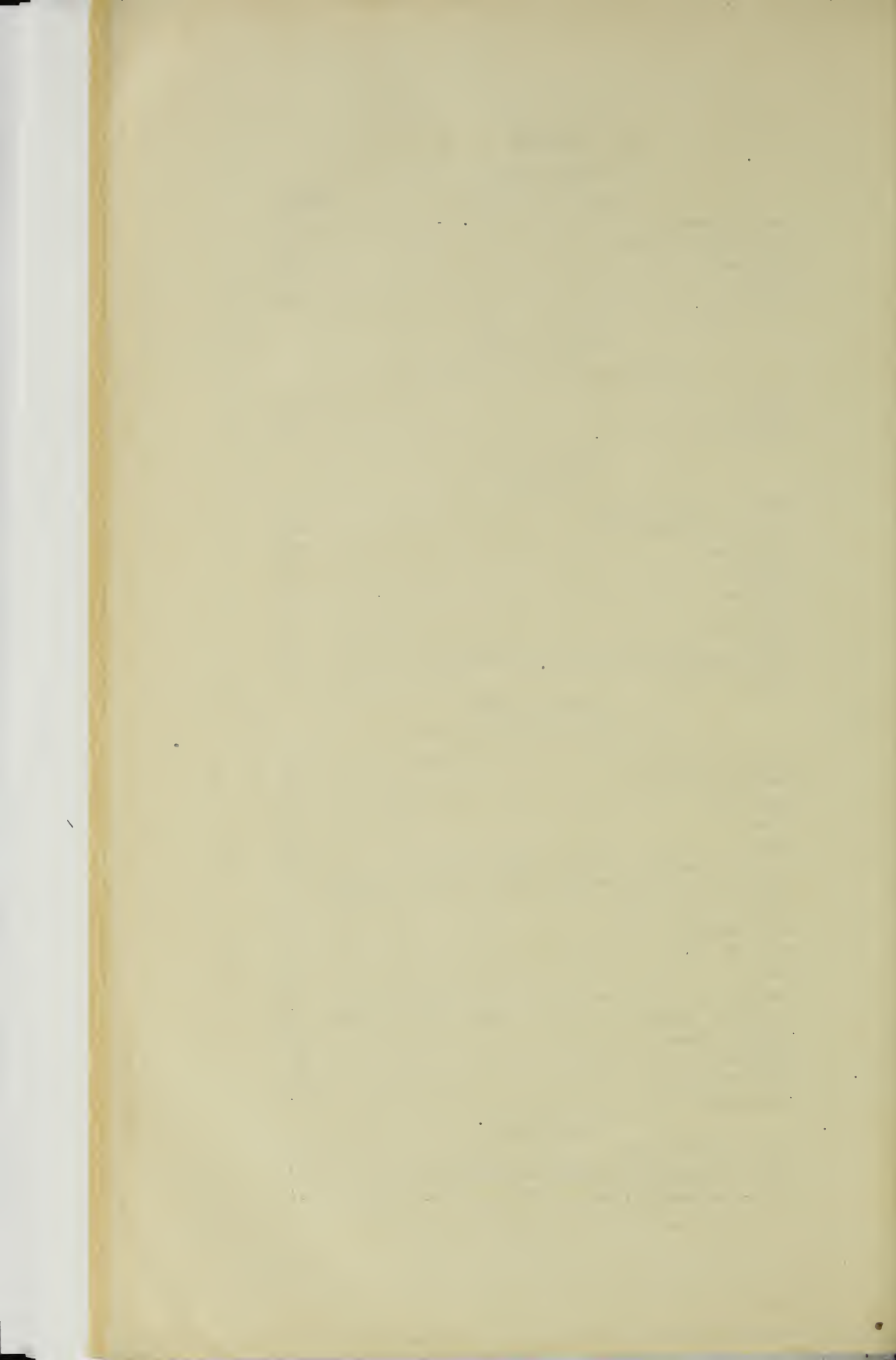
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Daily Diario	Daily Diario	Daily Diario	Daily Diario	General	Intern.		Daily Diario	Daily Diario	Daily Diario	Daily Diario
29B	29	3	1			ESTACIONES	2	4	30	30B
P. M.	P. M.	P. M.	A. M.	Kilómetros:			P. M.	A. M.	A. M.	P. M.
1.05	5.25	8.45	7.20	0	0	Sal. San Juan	Lleg. 5.08	7.03	10.10	7.15
1.09	5.29	8.50	7.25	2.9	2.9	Miramar (F)	5.03	6.59	10.06	7.10
1.14	5.35	8.59	7.31	4.2	1.3	Talleres	4.58	6.53	10.04	7.08
1.16	5.37	9.02	7.34	5.1	.9	Santurce (F)	4.54	6.49	10.00	7.04
1.23	5.43	9.10	7.41	7.9	2.8	Martín Peña	4.48	6.43	9.56	7.00
1.27	5.47	9.15	7.46	11.5	3.6	San Patricio (F)	4.40	6.35	9.52	6.56
1.39	6.00	9.31	8.01	19.1	7.6	Bayamón	4.27	6.21	9.40	6.44
1.46	6.07	9.40	8.09	23.9	4.8	Palosco (F)	4.16	6.10	9.33	6.37
1.53	6.14	9.49	8.17	28.5	4.6	Ingenio (F)	4.08	6.02	9.24	6.28
1.58	6.18	9.55	8.24	31.5	3.0	Manatí	4.03	5.56	9.20	6.24
2.01	6.21	10.00	8.28	32.9	1.4	Tos Baja	3.59	5.51	9.17	6.21
2.22	6.42	10.18	8.46	43.4	10.5	Dorado	3.41	5.33	9.01	6.06
2.26	6.47	10.26	8.52	46.2	2.8	San Vicente	3.35	5.27	8.52	5.57
2.31	6.52	10.32	8.58	50.0	3.8	Vega Baja	3.26	5.18	8.47	5.52
2.39	6.59	10.42	9.07	54.0	4.6	Algarrobo (F)	3.18	5.09	8.38	5.43
2.47	7.03	10.50	9.15	57.7	3.1	Campo Alegre	3.12	5.03	8.30	5.35
2.59	7.17	11.04	9.27	64.4	6.7	Manatí	2.59	4.48	8.19	5.24
3.09	7.27	11.18	9.41	72.8	8.4	Barcelona	2.44	4.32	8.11	5.16
3.14	7.35	11.25	9.47	79.7	3.9	Cummings (F)	2.38	4.25	8.01	5.05
3.22	7.42	11.35	9.56	81.5	4.8	Santana (F)	2.29	4.16	7.54	4.59
3.30	7.50	11.55	10.11	86.0	4.5	Cambalache	2.20	4.03	7.45	4.50
P. M.	P. M.	12.01	10.17			Lieg. Arecibo City	Sal. 2.14	4.00	A. M.	P. M.
		12.26	10.40	97.6	13.6	Arecibo City	Lieg. 2.14	4.00		
		12.31	10.44	99.1	1.5	Hatillo	1.44	3.27		
		12.51	11.04	110.8	11.7	Camuy	1.40	3.22		
		1.18	11.29	122.1	11.3	Quebradillas	1.19	3.01		
						Isabela	12.53	2.34		
		A. M.	1.52	12.05	20.4	Lieg. Aguadilla City	12.18	2.00	P. M.	
		7.48	2.06	12.30		Sal. Aguadilla City	11.53	1.46	8.46	
		7.57	2.17	12.41	4.9	Coloso	11.42	1.34	8.35	
		8.04	2.24	12.48	8.6	Aguada	11.34	1.26	8.28	
		8.13	2.35		5.0	Santoni Carretera F		1.16	8.17	
		8.24	2.45	1.09	6.7	Rincón	11.13	1.04	8.07	
		8.29	2.50	1.14	2.3	Córcega	11.07	12.58	8.02	
		8.41	3.02	1.26	7.6	Tres Hermanos (F)	10.54	12.45	7.49	
		8.49	3.12	1.36	4.6	Añasco	10.45	12.36	7.42	
		9.02	3.28	1.51	9.2	Lieg. Mayaguez Playa	10.28	12.17	7.27	P. M.
		9.10	3.44	2.00	9.2	Sal. Mayaguez Playa	10.19	12.01	7.19	3.15
		9.15	3.53	2.06	1.8	Mayaguez City	10.15	11.57	7.17	3.11
		9.31	4.10	2.23	10.1	Hormigueros	9.54	11.35	6.59	2.49
		9.38	4.17	2.30	4.0	Rio Rosario (F)	9.46	11.27	6.51	2.39
		9.50	4.22	2.35	1.3	Filial Amor	9.43	11.24	6.59	2.36
		A-21					A-22			
		9.50		203.5		Sal. Filial Amor	9.20		2.36	
		9.59		R 4.2		San Germán abajo.	9.10		2.14	
		10.02		R13.7		Lieg. Sabana Grande	8.50		1.50	
		10.18					A. M.			
		9.50		203.5		Sal. Filial Amor			6.59	
		10.01		R 7.3		Cabo Rojo			6.30	
		10.22		R18.2		Boquerón			6.12	
			4.33	2.45	5.3	San Germán arriba.	9.30	11.13		
			4.48	3.00	7.7	Lajas City	9.13	10.56		
			4.55	3.07	1.6	Lajas Estación	9.08	10.50	5.50	
			5.04	3.15	5.1	Lajas Arriba (F)	8.57	10.39	5.39	
			5.11	3.22	3.5	La Plata (F)	8.50	10.32	5.33	
			5.20	3.31	4.5	Limón (F)	8.43	10.23	5.25	
			5.33	3.44	6.5	Santa Rita	8.31	10.12	5.15	
			5.43	3.54	4.5	Yauco	8.21	10.02	5.07	
			5.46	4.06	8.3	Lluberías	8.07		4.51	
			6.04	4.15	4.1	Guayanilla	7.58	9.18	4.43	
			6.18	4.29	7.8	Tailaboa	7.44	9.24	4.30	
			6.41	4.50	14.3	Lieg. Ponce	Sal. 7.20	9.00	4.05	
P. N.	P. M.	A. N.	P. M.				A. M.	P. M.	P. M.	P. M.

AUTOMOTORES:—

NOTAS: La F delante y después de la hora de salida indica que es parada de señal para ese viaje.

Los trenes saldrán y llegarán a Arecibo City.

Los equipajes que se presenten para estos viajes y sean mayores de 100 libras serán transportados por los trenes regulares de viajeros, previo pago del exceso de acuerdo con la tarifa regular. Cuando no haya cabida en el Automotor, el equipaje será transportado por el próximo tren regular de viajeros.

TRENES:—

En las paradas de señal los trenes pararán a la señal de tomar o dejar pasajeros.

At flag stops trains stop on signal to receive or discharge passengers.

(F) En la columna de las horas indica parada de señal para ese tren.

In column showing time indicates flag stop for that train.

(F) Al lado del nombre de la Estación indica parada de señal para todos los trenes.

After name of Station indicates flag stop for all trains.

• Estación para comer — (Restaurant.)

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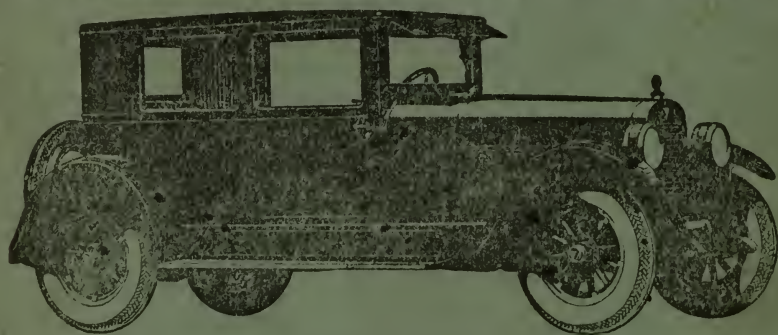
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